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DRINKING WATER SURVEILLANCE PROGRAM

KITCHENER WELL SUPPLY

ANNUAL REPORT 1990

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KITCHENER
WELL SUPPLY

DRINKING WATER SURVEILLANCE PROGRAM

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EXECUTIVE SUMMARY

DRINKING WATER SURVEILLANCE PROGRAM

KITCHENER WELL SUPPLY
1990 ANNUAL REPORT

The Drinking Water Surveillance Program (DWSP) for Ontario is a monitoring program providing immediate, reliable, current information on drinking water quality. The DWSP officially began in April 1986 and is designed to eventually include all municipal supplies in Ontario. In 1990, 76 systems were being monitored.

The Kitchener Well Supply is a groundwater source consisting of numerous wells in several aquifers. The following locations were sampled on DWSP:

1) K21 - as representative of the raw water from thr Mannheim East/West high capacity overburden well field at the western city limits of Kitchener;
2) Mannheim reservoir - treated water from the Mannheim well field;
3) Strange Street reservoir - treated water from one of the first well fields, located near the city-centre;
4) Well K70 - raw water, as representative of one of nine induced infiltration wells located on the east side of Kitchener, adjacent to the Grand River.

The only treatment provided is disinfection. The Kitchener Well Supply serves a population of approximately 147,400.

Raw water from K21 and K70, treated water from Mannheim and Strange Street Reservoirs and at one location in the distribution system was sampled for the presence of approximately 180 parameters. Parameters were divided into the following groups: bacteriological, inorganic and physical (laboratory chemistry, field chemistry and metals), and organic (chloroaromatics, chlorophenols, pesticides and PCB, phenolics, polyaromatic hydrocarbons, specific pesticides and volatiles). Samples were analyzed for specific pesticides and chlorophenols twice a year in the spring and fall.

Table A is a summary of all results by group.

No known health related guidelines were exceeded.

The Kitchener Well Supply, as sampled by DWSP, for the sample year 1990, produced good quality water and this was maintained in the distribution system.

TABLE A
DRINKING WATER SURVEILLANCE PROGRAM KITCHENER K21/MANNHEIM RESERVOIR

SUMMARY TABLE BY SCAN

A POSITIVE VALUE DENOTES THAT THE RESULT IS GREATER THAN THE STATISTICAL LIMIT OF DETECTION AND IS QUANTIFIABLE
A '.' INDICATES THAT NO SAMPLE WAS TAKEN

SCAN	SITE RAW TESTS	POSITIVE	%POSITIVE	TREATED TESTS	POSITIVE	%POSITIVE	SITE 1 TESTS	POSITIVE	%POSITIVE
BACTERIOLOGICAL	18	0	0	6	1	16	6	1	16
CHEMISTRY (FLD)	12	12	100	28	24	85	57	29	50
CHEMISTRY (LAB)	132	95	71	132	92	69	228	192	84
METALS	144	49	34	144	54	37	276	127	46
CHLOROAROMATICS	84	0	0	84	0	0	84	0	0
CHLOROPHENOLS	12	0	0	12	0	0	.	.	.
PAH	102	0	0	102	0	0	.	.	.
PESTICIDES & PCB	204	0	0	204	0	0	127	0	0
PHENOLICS	6	0	0	6	0	0	.	.	.
SPECIFIC PESTICIDES	58	0	0	58	0	0	6	0	0
VOLATILES	174	0	0	174	14	8	174	12	6
TOTAL	946	156		950	185		958	361	

TABLE A
DRINKING WATER SURVEILLANCE PROGRAM KITCHENER K70 (RECHARGE WELL)

SUMMARY TABLE BY SCAN

A POSITIVE VALUE DENOTES THAT THE RESULT IS GREATER THAN THE STATISTICAL LIMIT OF DETECTION AND IS QUANTIFIABLE
A '.' INDICATES THAT NO SAMPLE WAS TAKEN

SCAN	SITE RAW TESTS	POSITIVE	%POSITIVE
BACTERIOLOGICAL	15	1	6
CHEMISTRY (FLD)	10	10	100
CHEMISTRY (LAB)	110	89	80
METALS	120	44	36
CHLOROAROMATICS	70	0	0
CHLOROPHENOLS	12	0	0
PAH	84	0	0
PESTICIDES & PCB	170	0	0
PHENOLICS	5	0	0
SPECIFIC PESTICIDES	57	0	0
VOLATILES	145	0	0
TOTAL	798	144	

TABLE A
DRINKING WATER SURVEILLANCE PROGRAM KITCHENER (STRANGE STREET RESERVOIR)

SUMMARY TABLE BY SCAN

A POSITIVE VALUE DENOTES THAT THE RESULT IS GREATER THAN THE STATISTICAL LIMIT OF DETECTION AND IS QUANTIFIABLE
A '.' INDICATES THAT NO SAMPLE WAS TAKEN

SCAN	SITE TREATED TESTS	POSITIVE	%POSITIVE
BACTERIOLOGICAL	6	1	16
CHEMISTRY (FLD)	26	25	96
CHEMISTRY (LAB)	132	97	73
METALS	144	62	43
CHLOROAROMATICS	84	0	0
CHLOROPHENOLS	12	0	0
PAH	101	0	0
PESTICIDES & PCB	204	0	0
PHENOLICS	6	0	0
SPECIFIC PESTICIDES	58	0	0
VOLATILES	174	22	12
TOTAL	947	207	

DRINKING WATER SURVEILLANCE PROGRAM

KITCHENER WELL SUPPLY
1990 ANNUAL REPORT

INTRODUCTION

The Drinking Water Surveillance Program (DWSP) for Ontario is a monitoring program providing immediate, reliable, current information on drinking water quality. The DWSP officially began in April 1986 and is designed to eventually include all municipal supplies in Ontario. In 1990, 76 systems were being monitored.

Appendix A has a full description of the DWSP.

The DWSP was initiated for the Kitchener Well Supply in the spring of 1987. Previous annual reports have been published for 1987, 1988 and 1989.

PLANT DESCRIPTION

The Kitchener Well Supply is a groundwater source consisting of numerous wells in several aquifers. The following locations were sampled on DWSP:

1) K21 - as representative of the raw water from thr Mannheim East/West high capacity overburden well field at the western city limits of Kitchener;
2) Mannheim reservoir - treated water from the Mannheim well field;
3) Strange Street reservoir - treated water from one of the first well fields, located near the city-centre;
4) Well K70 - raw water, as representative of one of nine induced infiltration wells located on the east side of Kitchener, adjacent to the Grand River.

The only treatment provided is disinfection. The Kitchener Well Supply serves a population of approximately 147,400.

The sample day flows for the Mannheim well K21 ranged from 26.9 x 1000 m^3/day to 43.1 x 1000 m^3/day. The reported chlorine dosage for well K21 is the combined dosage for all 8 wells in the network supplying the Mannheim reservoir.

General plant information is presented in Table 1.

SAMPLING AND ANALYSES

Sample lines at the wells and reservoirs were flushed prior to sampling to ensure that the water obtained was indicative of its origin and not residual water standing in the sample line.

At all distribution system locations two types of samples were obtained, a standing and a free flow. The standing sample consisted of water that had been in the household plumbing and service connection for a minimum of six hours. These samples were used to make an assessment of the change in the levels of inorganic compounds and metals, due to leaching from, or deposition on, the plumbing system. The only analyses carried out on the standing samples therefore, were General Chemistry and Metals. The free flow sample represented fresh water from the distribution main, since the sample tap was flushed for five minutes prior to sampling.

Attempts were made to capture the same block of water at each sampling point by taking the retention time into consideration. Retention time was calculated by dividing the volume of water between two sampling points by sample day flow. For example, if it was determined that retention time within the plant was five hours, then there would be a five hour interval between the raw and treated sampling. Similarly, if it was estimated that it took approximately one day for the water to travel from the plant to the distribution system site, this site would be sampled one day after the treated water from the plant.

Stringent DWSP sampling protocols were followed to ensure that all samples were taken in a uniform manner (see Appendix B).

Plant operating personnel routinely analyze parameters for process control (Table 2).

Raw water from K21 and K70, treated water from Mannheim and Strange Street Reservoirs and at one location in the distribution system was sampled for the presence of approximately 180 parameters. Parameters were divided into the following groups: bacteriological, inorganic and physical (laboratory chemistry, field chemistry and metals), and organic (chloroaromatics, chlorophenols, pesticides and PCB, phenolics, polyaromatic hydrocarbons, specific pesticides and volatiles). Samples were analyzed for specific pesticides and chlorophenols twice a year in the spring and fall. Laboratory analyses were conducted at the Ministry of the Environment facilities in Rexdale, Ontario.

RESULTS

Field measurements were recorded on the day of sampling and were entered onto the DWSP database as submitted by plant personnel.

Table 3 contains information on delay time between raw and treated water sampling, flow rate, and treatment chemical dosages.

Table 4 is a summary break-down of the number of water samples analyzed by parameter and by water type. The number of times that a positive or trace result was detected is also reported.

Positive denotes that the result is greater than the statistical limit of detection established by the Ministry of the Environment laboratory staff and is quantifiable. Trace (<T) denotes that the level measured is greater than the lowest value detectable by the method but lies so close to the detection limit that it cannot be confidently quantified.

Table 5 presents the results for parameters detected on at least one occasion.

Table 6 lists all parameters analyzed in the DWSP.

Associated guidelines and detection limits are also supplied on Tables 5 and 6. Parameters are listed alphabetically within each scan.

DISCUSSION

GENERAL

Water quality was judged by comparison with the Ontario Drinking Water Objectives publication (ODWOs). When an Ontario Drinking Water Objective (ODWO) was not available, guidelines/limits from other agencies were used. These guidelines were obtained from the Parameter Listing System database.

IN THIS REPORT, DISCUSSION IS LIMITED TO:

- **RESULTS FROM RAW AND DISTRIBUTED WATERS;**
- **THOSE PARAMETERS WITH CONCENTRATIONS ABOVE GUIDELINE VALUES;**
- **POSITIVE ORGANIC PARAMETERS DETECTED; AND**
- **PERSISTENT TRACES OF ORGANIC PARAMETERS IN THE RAW WATER.**

In this report comments are combined for all sample locations for each parameter discussed. The water in the distribution system can be a mixture from many sources. Due to the many wells supplying this water system and the relatively few sample locations on DWSP, this report does not provide a complete picture of the drinking water quality.

BACTERIOLOGICAL

Guidelines for bacteriological sampling and testing of a supply are developed to maintain a proper supervision of its bacteriological quality. Routine monitoring programs usually require that multiple samples be collected in a given system. Full interpretation of bacteriological quality cannot be made on the basis of single samples.

Standard plate count was the only bacteriological analysis conducted on the treated and distributed water. No results were reported above the guideline.

INORGANIC & PHYSICAL

CHEMISTRY (LAB)

Calcium exceeded the European Economic Community (EEC) Aesthetic Guideline Level of 100 mg/L in 1 of 6 distributed water samples and in all 6 samples from Strange Street Reservoir with a maximum reported value of 137.0 mg/L.

Elevated conductivity is often associated with high hardness levels.

Conductivity exceeded the EEC Aesthetic Guideline Level of 400 umho/cm in all raw, treated and distributed water samples with a maximum reported value of 1,161.0 umho/cm.

The ODWOs indicate that a hardness level of between 80 and 100 mg/L as calcium carbonate for domestic waters provides an acceptable balance between corrosion and encrustation. Water supplies with a hardness greater than 200 mg/L are considered poor and would possess a tendency to form scale deposits and result in excessive soap consumption.

Hardness exceeded the ODWO Aesthetic or Recommended Operational Guideline of 80-100 mg/L in all raw, treated and distributed water samples with a maximum reported value of 500.0 mg/L.

Magnesium exceeded the EEC Aesthetic Guideline Level of 30 mg/L in 2 of 6 distributed water samples and in all 6 samples from Strange Street Reservoir with a maximum reported value of 42.0 mg/L.

Total ammonium exceeded the EEC Aesthetic Guideline Level of 0.05 mg/L in 2 of 18 treated and distributed water samples with a maximum reported value of 0.17 mg/L.

METALS

Iron exceeded the ODWO Maximum Desirable Concentration of 300 ug/L in 1 of 6 distributed water samples. The exceedance occurred in September at 400.0 ug/L.

Manganese, in high concentrations, can contribute to laundry staining and undesirable tastes.

Manganese exceeded the ODWO Maximum Desirable Concentration of 50 ug/L in 2 of 5 raw samples from the K70 well; in 2 of 6 distributed water samples; and in all 6 samples from Strange Street Reservoir with a maximum reported value of 250.0 ug/L.

ORGANIC

CHLOROAROMATICS

The results of the chloroaromatic scan showed that one parameter was detected at a trace level in one sample.

CHLOROPHENOLS

The results of the chlorophenol scan showed that none were detected.

POLYAROMATIC HYDROCARBONS (PAH)

The results of the PAH scan showed that none were detected.

PESTICIDES & PCB

The results of the PCB scan showed that none were detected.

The results of the regular pesticide scan showed that one pesticide was detected at trace levels in 4 of 11 samples from the Mannheim Reservoir and the K70 infiltration well.

PHENOLICS

Phenolic compounds are present in the aquatic environment as a result of natural and/or industrial processes. The ODWOs recommend, as an operational guideline, that phenolic substances in drinking water not exceed 2.0 ug/L. This limit has been set primarily to prevent undesirable taste and odours, particularly in chlorinated water. No results were reported above trace levels.

SPECIFIC PESTICIDES

The results of the specific pesticides scan showed that none were detected.

VOLATILES

1,1-Dichloroethane was detected at positive levels in one distribution sample with a reported value of 1.2 ug/L. There is no guideline available for 1,1-Dichloroethane.

1,1,1-Trichloroethane was detected at positive levels in all six samples from the Strange Street Reservoir with a maximum reported value of 0.98 ug/L. The United States Environmental Protection Agency has a Maximum Contaminant Level of 200.0 ug/L.

Trichloroethylene was also detected at trace levels in all six samples from the Strange Street Reservoir.

The detection of benzene, ethylbenzene, toluene and xylenes at low, trace levels may be a laboratory artifact derived from the analytical methodology.

Trihalomethanes (THMs) are produced during the water treatment process and will always occur in chlorinated waters. THMs are comprised of chloroform, chlorodibromomethane and dichlorobromomethane; bromoform occurs occasionally. Results are reported for the individual compounds as well as for total THMs. Only total THMs results are discussed.

Total THMs were found at positive levels in 5 of the 18 treated and distributed water samples analyzed. The maximum observed level was 8.95 ug/L. This was below the ODWO Maximum Acceptable Concentration of 350 ug/L.

CONCLUSIONS

The Kitchener Well Supply, as sampled by DWSP, for the sample year 1990, produced good quality water and this was maintained in the distribution system.

No known health related guidelines were exceeded.

TABLE 1

DRINKING WATER SURVEILLANCE PROGRAM

PLANT GENERAL REPORT

WORKS #:	220003092
PLANT NAME:	KITCHENER WELL SUPPLY
DISTRICT:	CAMBRIDGE
REGION:	WEST CENTRAL
DISTRICT OFFICER:	D. IRELAND
UTM #:	175386004806375
PLANT SUPERINTENDENT:	BRIAN PETT
ADDRESS:	2069 OTTAWA ST. KITCHENER, ONTARIO N2E 3K3 (519)571-6203
MUNICIPALITY:	REGION OF WATERLOO
AUTHORITY:	MUNICIPAL

PLANT INFORMATION

PLANT VOLUME:	-	(X 1000 M3)
DESIGN CAPACITY:	-	(X 1000 M3/DAY)
RATED CAPACITY:	-	(X 1000 M3/DAY)

MUNICIPALITY	POPULATION
KITCHENER	147,439

TABLE 3

DRINKING WATER SURVEILLANCE PROGRAM KITCHENER K21 (MANNHEIM RESERVOIR) SAMPLE DAY CONDITIONS FOR 1990

			TREATMENT CHEMICAL DOSAGE MG/L PRE CHLORINATION
			SODIUM HYPOCHLORITE **
DATE	DELAY * TIME(HRS)	FLOW (1000M3)	
JAN 16	.25	37.812	.00
MAR 20	.00	41.702	2.05
MAY 29	.00	42.300	1.73
JUL 24	.00	42.900	2.32
SEP 18	.00	26.936	1.50
NOV 20	.00	43.098	1.50

** REPORTED CHLORINE DOSAGE FOR ALL 8 WELLS SUPPLYING THE MANNHEIM RESERVOIR.

* THE DELAY TIME BETWEEN THE RAW AND TREATED WATER SAMPLING, SHOULD ESTIMATE THE RETENTION TIME.

TABLE 3

DRINKING WATER SURVEILLANCE PROGRAM KITCHENER (INDUCED INFILTRATION WELL K70) SAMPLE DAY CONDITIONS FOR 1990

			TREATMENT CHEMICAL DOSAGE MG/L PRE CHLORINATION
			SODIUM HYPOCHLORITE
DATE	DELAY * TIME(HRS)	FLOW (1000M3)	
JAN 16	.00	3.168	.38
MAY 29	.00	2.880	.55
JUL 24	.00	2.880	.64
SEP 18	.00	2.520	.62
NOV 20	.00	2.433	1.10

* THE DELAY TIME BETWEEN THE RAW AND TREATED WATER SAMPLING, SHOULD ESTIMATE THE RETENTION TIME.

TABLE 4
DRINKING WATER SURVEILLANCE PROGRAM KITCHENER WELL SUPPLY K21/MANNHEIM
SUMMARY TABLE OF RESULTS (1990)

SCAN PARAMETER	RAW			TREATED			SITE 1		
	TOTAL	POSITIVE	TRACE	TOTAL	POSITIVE	TRACE	TOTAL	POSITIVE	TRACE
BACTERIOLOGICAL									
FECAL COLIFORM MF	6	0	0	.	.	.	.	.	.
STANDRD PLATE CNT MF	.	.	.	6	1	0	6	1	0
TOTAL COLIFORM MF	6	0	0	.	.	.	.	.	.
T COLIFORM BCKGRD MF	6	0	0	.	.	.	.	.	.
*TOTAL GROUP BACTERIOLOGICAL	18	0	0	6	1	0	6	1	0
CHEMISTRY (FLD)									
FLD CHLORINE (COMB)	.	.	.	6	5	0	11	2	0
FLD CHLORINE FREE	.	.	.	4	2	0	11	1	0
FLD CHLORINE (TOTAL)	.	.	.	6	5	0	11	2	0
FLD PH	6	6	0	6	6	0	12	12	0
FLD TEMPERATURE	6	6	0	6	6	0	12	12	0
*TOTAL SCAN CHEMISTRY (FLD)	12	12	0	28	24	0	57	29	0
CHEMISTRY (LAB)									
ALKALINITY	6	6	0	6	6	0	12	12	0
CALCIUM	6	6	0	6	6	0	12	12	0
CYANIDE	6	0	0	6	0	0	.	.	.
CHLORIDE	6	6	0	6	6	0	12	12	0
COLOUR	6	1	1	6	0	4	12	2	4
CONDUCTIVITY	6	6	0	6	6	0	12	12	0
DISS ORG CARBON	6	6	0	6	6	0	12	12	0
FLUORIDE	6	6	0	6	6	0	12	12	0
HARDNESS	6	6	0	6	6	0	12	12	0
IONCAL	6	6	0	6	6	0	12	12	0
LANGELIERS INDEX	6	6	0	6	6	0	12	12	0
MAGNESIUM	6	6	0	6	6	0	12	12	0
SODIUM	6	6	0	6	6	0	12	12	0
AMMONIUM TOTAL	6	1	0	6	0	0	12	1	1
NITRITE	6	4	2	6	1	2	12	3	6
TOTAL NITRATES	6	6	0	6	6	0	12	12	0
NITROGEN TOT KJELD	6	1	4	6	3	3	12	8	4
PH	6	6	0	6	6	0	12	12	0
PHOSPHORUS FIL REACT	6	0	5	6	0	5	.	.	.
PHOSPHORUS TOTAL	6	0	4	6	0	3	.	.	.
SULPHATE	6	6	0	6	6	0	12	12	0
TURBIDITY	6	4	2	6	4	2	12	10	2
*TOTAL SCAN CHEMISTRY (LAB)	132	95	18	132	92	19	228	192	17

TABLE 4
DRINKING WATER SURVEILLANCE PROGRAM KITCHENER WELL SUPPLY K21/MANNHEIM
SUMMARY TABLE OF RESULTS (1990)

SCAN PARAMETER	RAW			TREATED			SITE 1		
	TOTAL	POSITIVE	TRACE	TOTAL	POSITIVE	TRACE	TOTAL	POSITIVE	TRACE
METALS									
SILVER	6	0	0	6	0	0	12	0	0
ALUMINUM	6	6	0	6	6	0	12	12	0
ARSENIC	6	0	6	6	0	6	12	2	10
BARIUM	6	6	0	6	6	0	12	12	0
BORON	6	2	4	6	2	4	12	6	6
BERYLLIUM	6	0	1	6	0	1	12	0	2
CADMIUM	6	0	0	6	0	0	12	0	3
COBALT	6	0	3	6	0	3	12	0	8
CHROMIUM	6	1	3	6	1	4	12	3	5
COPPER	6	0	5	6	3	3	12	12	0
IRON	6	0	1	6	0	4	12	4	7
MERCURY	6	0	2	6	0	1	.	.	.
MANGANESE	6	6	0	6	6	0	12	12	0
MOLYBDENUM	6	5	1	6	4	2	12	5	7
NICKEL	6	0	2	6	2	0	12	3	2
LEAD	6	0	5	6	0	4	12	6	6
ANTIMONY	6	0	6	6	0	6	12	2	10
SELENIUM	6	0	0	6	0	1	12	0	2
STRONTIUM	6	6	0	6	6	0	12	12	0
TITANIUM	6	6	0	6	6	0	12	12	0
THALLIUM	6	0	0	6	0	0	12	0	1
URANIUM	6	5	1	6	6	0	12	12	0
VANADIUM	6	0	6	6	0	6	12	0	12
ZINC	6	6	0	6	6	0	12	12	0
*TOTAL SCAN METALS	144	49	46	144	54	45	276	127	81
*TOTAL GROUP INORGANIC & PHYSICAL	288	156	64	304	170	64	561	348	98
CHLOROAROMATICS									
HEXACHLOROBUTADIENE	6	0	0	6	0	0	6	0	0
123 TRICHLOROBENZENE	6	0	0	6	0	0	6	0	0
1234 T-CHLOROBENZENE	6	0	0	6	0	0	6	0	0
1235 T-CHLOROBENZENE	6	0	0	6	0	0	6	0	0
124 TRICHLOROBENZENE	6	0	0	6	0	0	6	0	0
1245 T-CHLOROBENZENE	6	0	0	6	0	0	6	0	0
135 TRICHLOROBENZENE	6	0	0	6	0	0	6	0	0
HCB	6	0	0	6	0	0	6	0	0
HEXACHLOROETHANE	6	0	0	6	0	1	6	0	0
OCTACHLOROSTYRENE	6	0	0	6	0	0	6	0	0
PENTACHLOROBENZENE	6	0	0	6	0	0	6	0	0
236 TRICHLOROTOLUENE	6	0	0	6	0	0	6	0	0
245 TRICHLOROTOLUENE	6	0	0	6	0	0	6	0	0
26A TRICHLOROTOLUENE	6	0	0	6	0	0	6	0	0
*TOTAL SCAN CHLOROAROMATICS	84	0	0	84	0	1	84	0	0

TABLE 4
DRINKING WATER SURVEILLANCE PROGRAM KITCHENER WELL SUPPLY K21/MANNHEIM
SUMMARY TABLE OF RESULTS (1990)

SCAN PARAMETER	RAW TOTAL	RAW POSITIVE	RAW TRACE	TREATED TOTAL	TREATED POSITIVE	TREATED TRACE	SITE 1 TOTAL	SITE 1 POSITIVE	SITE 1 TRACE
CHLOROPHENOLS									
234 TRICHLOROPHENOL	2	0	0	2	0	0	.	.	.
2345 T-CHLOROPHENOL	2	0	0	2	0	0	.	.	.
2356 T-CHLOROPHENOL	2	0	0	2	0	0	.	.	.
245-TRICHLOROPHENOL	2	0	0	2	0	0	.	.	.
246-TRICHLOROPHENOL	2	0	0	2	0	0	.	.	.
PENTACHLOROPHENOL	2	0	0	2	0	0	.	.	.
*TOTAL SCAN CHLOROPHENOLS	12	0	0	12	0	0	0	0	0
PAH									
PHENANTHRENE	6	0	0	6	0	0	.	.	.
ANTHRACENE	6	0	0	6	0	0	.	.	.
FLUORANTHENE	6	0	0	6	0	0	.	.	.
PYRENE	6	0	0	6	0	0	.	.	.
BENZO(A)ANTHRACENE	6	0	0	6	0	0	.	.	.
CHRYSENE	6	0	0	6	0	0	.	.	.
DIMETH. BENZ(A)ANTHR	6	0	0	6	0	0	.	.	.
BENZO(E) PYRENE	6	0	0	6	0	0	.	.	.
BENZO(B) FLUORANTHEN	6	0	0	6	0	0	.	.	.
PERYLENE	6	0	0	6	0	0	.	.	.
BENZO(K) FLUORANTHEN	6	0	0	6	0	0	.	.	.
BENZO(A) PYRENE	6	0	0	6	0	0	.	.	.
BENZO(G,H,I) PERYLEN	6	0	0	6	0	0	.	.	.
DIBENZO(A,H) ANTHRAC	6	0	0	6	0	0	.	.	.
INDENO(1,2,3-C,D) PY	6	0	0	6	0	0	.	.	.
BENZO(B) CHRYSENE	6	0	0	6	0	0	.	.	.
CORONENE	6	0	0	6	0	0	.	.	.
*TOTAL SCAN PAH	102	0	0	102	0	0	0	0	0
PESTICIDES & PCB									
ALDRIN	6	0	0	6	0	0	6	0	0
ALPHA BHC	6	0	0	6	0	0	6	0	0
BETA BHC	6	0	0	6	0	0	6	0	0
LINDANE	6	0	0	6	0	0	6	0	0
ALPHA CHLORDANE	6	0	0	6	0	0	6	0	0
GAMMA CHLORDANE	6	0	0	6	0	0	6	0	0
DIELDRIN	6	0	0	6	0	0	6	0	0
METHOXYCHLOR	6	0	0	6	0	0	6	0	0
ENDOSULFAN 1	6	0	0	6	0	0	6	0	0
ENDOSULFAN II	6	0	0	6	0	0	6	0	0
ENDRIN	6	0	0	6	0	0	6	0	0
ENDOSULFAN SULPHATE	6	0	0	6	0	0	6	0	0
HEPTACHLOR EPOXIDE	6	0	0	6	0	0	6	0	0
HEPTACHLOR	6	0	0	6	0	0	6	0	0
MIREX	6	0	0	6	0	0	6	0	0
OXYCHLORDANE	6	0	0	6	0	0	6	0	0
OPDDT	6	0	0	6	0	0	6	0	0
PCB	6	0	0	6	0	0	6	0	0
DDD	6	0	0	6	0	0	6	0	0
PPDDE	6	0	0	6	0	0	6	0	0

TABLE 4
DRINKING WATER SURVEILLANCE PROGRAM KITCHENER WELL SUPPLY K21/MANNHEIM
SUMMARY TABLE OF RESULTS (1990)

SCAN PARAMETER	RAW			TREATED			SITE 1		
	TOTAL	POSITIVE	TRACE	TOTAL	POSITIVE	TRACE	TOTAL	POSITIVE	TRACE
PPDDT	6	0	0	6	0	0	6	0	0
AMETRINE	6	0	0	6	0	0	.	.	.
ATRAZINE	6	0	0	6	0	1	.	.	.
ATRATONE	6	0	0	6	0	0	.	.	.
CYANAZINE (BLADEX)	6	0	0	6	0	0	.	.	.
DESETHYLATRAZINE	6	0	0	6	0	0	.	.	.
D-ETHYL SIMAZINE	5	0	0	5	0	0	.	.	.
PROMETONE	6	0	0	6	0	0	.	.	.
PROPAZINE	6	0	0	6	0	0	.	.	.
PROMETRYNE	6	0	0	6	0	0	.	.	.
METRIBUZIN (SENCOR)	6	0	0	6	0	0	.	.	.
SIMAZINE	6	0	0	6	0	0	.	.	.
ALACHLOR (LASSO)	6	0	0	6	0	0	.	.	.
METOLACHLOR	6	0	0	6	0	0	.	.	.
HEXACLCYCLOPENTADIEN	1	0	0	1	0	0	1	0	0
*TOTAL SCAN PESTICIDES & PCB	204	0	0	204	0	1	127	0	0
PHENOLICS									
PHENOLICS	6	0	3	6	0	1	.	.	.
*TOTAL SCAN PHENOLICS	6	0	3	6	0	1	0	0	0
SPECIFIC PESTICIDES									
TOXAPHENE	6	0	0	6	0	0	6	0	0
2,4,5-T	2	0	0	2	0	0	.	.	.
2,4-D	2	0	0	2	0	0	.	.	.
2,4-DB	2	0	0	2	0	0	.	.	.
2,4 D PROPIONIC ACID	2	0	0	2	0	0	.	.	.
DICAMBA	2	0	0	2	0	0	.	.	.
PICHLORAM	0	0	0	0	0	0	.	.	.
SILVEX	2	0	0	2	0	0	.	.	.
DIAZINON	2	0	0	2	0	0	.	.	.
DICHLOROVOS	2	0	0	2	0	0	.	.	.
CHLORPYRIFOS	2	0	0	2	0	0	.	.	.
ETHION	2	0	0	2	0	0	.	.	.
AZINPHOS-METHYL	0	0	0	0	0	0	.	.	.
MALATHION	2	0	0	2	0	0	.	.	.
MEVINPHOS	2	0	0	2	0	0	.	.	.
METHYL PARATHION	2	0	0	2	0	0	.	.	.
METHYLTRITHION	2	0	0	2	0	0	.	.	.
PARATHION	2	0	0	2	0	0	.	.	.
PHORATE	2	0	0	2	0	0	.	.	.
RELDAN	2	0	0	2	0	0	.	.	.
RONNEL	2	0	0	2	0	0	.	.	.
AMINOCARB	0	0	0	0	0	0	.	.	.
BENONYL	0	0	0	0	0	0	.	.	.
BUX	0	0	0	0	0	0	.	.	.
CARBOFURAN	2	0	0	2	0	0	.	.	.
CICP	2	0	0	2	0	0	.	.	.
DIALLATE	2	0	0	2	0	0	.	.	.

TABLE 4
DRINKING WATER SURVEILLANCE PROGRAM KITCHENER WELL SUPPLY K21/MANNHEIM
SUMMARY TABLE OF RESULTS (1990)

SCAN PARAMETER	RAW			TREATED			SITE 1		
	TOTAL	POSITIVE	TRACE	TOTAL	POSITIVE	TRACE	TOTAL	POSITIVE	TRACE
EPTAM	2	0	0	2	0	0	.	.	.
IPC	2	0	0	2	0	0	.	.	.
PROPOXUR	2	0	0	2	0	0	.	.	.
CARBARYL	2	0	0	2	0	0	.	.	.
BUTYLATE	2	0	0	2	0	0	.	.	.
*TOTAL SCAN SPECIFIC PESTICIDES	58	0	0	58	0	0	6	0	0
VOLATILES									
BENZENE	6	0	0	6	0	2	6	0	3
TOLUENE	6	0	0	6	0	1	6	0	1
ETHYLBENZENE	6	0	4	6	0	4	6	0	4
P-XYLENE	6	0	0	6	0	0	6	0	0
M-XYLENE	6	0	0	6	0	1	6	0	0
O-XYLENE	6	0	0	6	0	2	6	0	0
STYRENE	6	0	6	6	0	5	6	0	5
1,1 DICHLOROETHYLENE	6	0	0	6	0	0	6	0	0
METHYLENE CHLORIDE	6	0	0	6	0	0	6	0	0
T1,2DICHLOROETHYLENE	6	0	0	6	0	0	6	0	0
1,1 DICHLOROETHANE	6	0	0	6	0	0	6	1	1
CHLOROFORM	6	0	0	6	1	5	6	1	5
111, TRICHLOROETHANE	6	0	0	6	0	0	6	0	2
1,2 DICHLOROETHANE	6	0	0	6	0	0	6	0	0
CARBON TETRACHLORIDE	6	0	0	6	0	0	6	0	0
1,2 DICHLOROPROPANE	6	0	0	6	0	0	6	0	0
TRICHLOROETHYLENE	6	0	0	6	0	0	6	0	0
DICHLOROBROMOMETHANE	6	0	0	6	6	0	6	5	1
112 TRICHLOROETHANE	6	0	0	6	0	0	6	0	0
CHLORODIBROMOMETHANE	6	0	0	6	6	0	6	4	2
T-CHLOROETHYLENE	6	0	0	6	0	0	6	0	0
BROMOFORM	6	0	0	6	0	6	6	0	5
1122 T-CHLOROETHANE	6	0	0	6	0	0	6	0	0
CHLOROBENZENE	6	0	0	6	0	0	6	0	0
1,4 DICHLOROBENZENE	6	0	0	6	0	0	6	0	0
1,3 DICHLOROBENZENE	6	0	0	6	0	0	6	0	0
1,2 DICHLOROBENZENE	6	0	0	6	0	0	6	0	0
ETHLYENE DIBROMIDE	6	0	0	6	0	0	6	0	0
TOTL TRIHALOMETHANES	6	0	0	6	1	5	6	1	5
*TOTAL SCAN VOLATILES	174	0	10	174	14	31	174	12	34
*TOTAL GROUP ORGANIC	640	0	13	640	14	34	391	12	34

TABLE 4
DRINKING WATER SURVEILLANCE PROGRAM KITCHENER K7O INDUCED INFILTRATION WELL
SUMMARY TABLE OF RESULTS (1990)

SCAN PARAMETER	RAW TOTAL	POSITIVE	TRACE
BACTERIOLOGICAL			
FECAL COLIFORM MF	5	0	0
TOTAL COLIFORM MF	5	1	0
T COLIFORM BCKGRD MF	5	0	0
*TOTAL GROUP BACTERIOLOGICAL	15	1	0
CHEMISTRY (FLD)			
FLD PH	5	5	0
FLD TEMPERATURE	5	5	0
*TOTAL SCAN CHEMISTRY (FLD)	10	10	0
CHEMISTRY (LAB)			
ALKALINITY	5	5	0
CALCIUM	5	5	0
CYANIDE	5	0	0
CHLORIDE	5	5	0
COLOUR	5	5	0
CONDUCTIVITY	5	5	0
DISS ORG CARBON	5	5	0
FLUORIDE	5	5	0
HARDNESS	5	5	0
IONCAL	5	5	0
LANGELIERS INDEX	5	5	0
MAGNESIUM	5	5	0
SODIUM	5	5	0
AMMONIUM TOTAL	5	2	0
NITRITE	5	2	3
TOTAL NITRATES	5	5	0
NITROGEN TOT KJELD	5	5	0
PH	5	5	0
PHOSPHORUS FIL REACT	5	1	3
PHOSPHORUS TOTAL	5	1	4
SULPHATE	5	5	0
TURBIDITY	5	3	2
*TOTAL SCAN CHEMISTRY (LAB)	110	89	12
METALS			
SILVER	5	0	0
ALUMINUM	5	5	0
ARSENIC	5	0	4

TABLE 4
DRINKING WATER SURVEILLANCE PROGRAM KITCHENER K70 INDUCED INFILTRATION WELL
SUMMARY TABLE OF RESULTS (1990)

SCAN PARAMETER	RAW TOTAL	POSITIVE	TRACE
BARIUM	5	5	0
BORON	5	4	1
BERYLLIUM	5	0	1
CADMIUM	5	0	0
COBALT	5	0	3
CHROMIUM	5	1	3
COPPER	5	0	5
IRON	5	0	1
MERCURY	5	0	2
MANGANESE	5	4	1
MOLYBDENUM	5	5	0
NICKEL	5	0	2
LEAD	5	1	4
ANTIMONY	5	0	5
SELENIUM	5	0	0
STRONTIUM	5	5	0
TITANIUM	5	5	0
THALLIUM	5	0	0
URANIUM	5	4	1
VANADIUM	5	0	5
ZINC	5	5	0
*TOTAL SCAN METALS	120	44	38
*TOTAL GROUP INORGANIC & PHYSICAL	240	143	50
CHLOROAROMATICS			
HEXACHLOROBUTADIENE	5	0	0
123 TRICHLOROBENZENE	5	0	0
1234 T-CHLOROBENZENE	5	0	0
1235 T-CHLOROBENZENE	5	0	0
124 TRICHLOROBENZENE	5	0	0
1245 T-CHLOROBENZENE	5	0	0
135 TRICHLOROBENZENE	5	0	0
HCB	5	0	0
HEXACHLOROETHANE	5	0	0
OCTACHLOROSTYRENE	5	0	0
PENTACHLOROBENZENE	5	0	0
236 TRICHLOROTOLUENE	5	0	0
245 TRICHLOROTOLUENE	5	0	0
26A TRICHLOROTOLUENE	5	0	0
*TOTAL SCAN CHLOROAROMATICS	70	0	0
CHLOROPHENOLS			
234 TRICHLOROPHENOL	2	0	0
2345 T-CHLOROPHENOL	2	0	0
2356 T-CHLOROPHENOL	2	0	0
245-TRICHLOROPHENOL	2	0	0
246-TRICHLOROPHENOL	2	0	0
PENTACHLOROPHENOL	2	0	0

TABLE 4
DRINKING WATER SURVEILLANCE PROGRAM KITCHENER K7O INDUCED INFILTRATION WELL
SUMMARY TABLE OF RESULTS (1990)

SCAN PARAMETER	RAW TOTAL	POSITIVE	TRACE
*TOTAL SCAN CHLOROPHENOLS	12	0	0
PAH			
PHENANTHRENE	5	0	0
ANTHRACENE	4	0	0
FLUORANTHENE	5	0	0
PYRENE	5	0	0
BENZO(A)ANTHRACENE	5	0	0
CHRYSENE	5	0	0
DIMETH. BENZ(A)ANTHR	5	0	0
BENZO(E) PYRENE	5	0	0
BENZO(B) FLUORANTHEN	5	0	0
PERYLENE	5	0	0
BENZO(K) FLUORANTHEN	5	0	0
BENZO(A) PYRENE	5	0	0
BENZO(G,H,I) PERYLEN	5	0	0
DIBENZO(A,H) ANTHRAC	5	0	0
INDENO(1,2,3-C,D) PY	5	0	0
BENZO(B) CHRYSENE	5	0	0
CORONENE	5	0	0
*TOTAL SCAN PAH	84	0	0
PESTICIDES & PCB			
ALDRIN	5	0	D
ALPHA BHC	5	0	0
BETA BHC	5	0	0
LINDANE	5	0	0
ALPHA CHLORDANE	5	0	0
GAMMA CHLORDANE	5	0	0
DIELDRIN	5	0	0
METHOXYCHLOR	5	0	0
ENDOSULFAN 1	5	0	0
ENDOSULFAN II	5	0	0
ENDRIN	5	0	0
ENDOSULFAN SULPHATE	5	0	0
HEPTACHLOR EPOXIDE	5	0	0
HEPTACHLOR	5	0	0
MIREX	5	0	0
OXYCHLORDANE	5	0	0
OPDDT	5	0	0
PCB	5	0	0
DDD	5	0	0
PPDDE	5	0	0
PPDDT	5	0	0
AMETRINE	5	0	0
ATRAZINE	5	0	3
ATRATONE	5	0	0
CYANAZINE (BLADEX)	5	0	0
DESETHYLATRAZINE	5	0	0
D-ETHYL SIMAZINE	4	0	0

TABLE 4
DRINKING WATER SURVEILLANCE PROGRAM KITCHENER K70 INDUCED INFILTRATION WELL
SUMMARY TABLE OF RESULTS (1990)

SCAN PARAMETER	RAW TOTAL	POSITIVE	TRACE
PROMETONE	5	0	0
PROPAZINE	5	0	0
PROMETRYNE	5	0	0
METRIBUZIN (SENCOR)	5	0	0
SIMAZINE	5	0	0
ALACHLOR (LASSO)	5	0	0
METOLACHLOR	5	0	0
HEXACLCYCLOPENTADIEN	1	0	0
*TOTAL SCAN PESTICIDES & PCB	170	0	3
PHENOLICS			
PHENOLICS	5	0	0
*TOTAL SCAN PHENOLICS	5	0	0
SPECIFIC PESTICIDES			
TOXAPHENE	5	0	0
2,4,5-T	2	0	0
2,4-D	2	0	0
2,4-DB	2	0	0
2,4 D PROPIONIC ACID	2	0	0
DICAMBA	2	0	0
PICHLORAM	0	0	0
SILVEX	2	0	0
DIAZINON	2	0	0
DICHLOROVOS	2	0	0
CHLORPYRIFOS	2	0	0
ETHION	2	0	0
AZINPHOS-METHYL	0	0	0
MALATHION	2	0	0
MEVINPHOS	2	0	0
METHYL PARATHION	2	0	0
METHYLTRITHION	2	0	0
PARATHION	2	0	0
PHORATE	2	0	0
RELDAN	2	0	0
RONNEL	2	0	0
AMINOCARB	0	0	0
BENONYL	0	0	0
BUX	0	0	0
CARBOFURAN	2	0	0
CICP	2	0	0
DIALLATE	2	0	0
EPTAM	2	0	0
IPC	2	0	0
PROPOXUR	2	0	0
CARBARYL	2	0	0
BUTYLATE	2	0	0
*TOTAL SCAN SPECIFIC PESTICIDES	57	0	0

TABLE 4
DRINKING WATER SURVEILLANCE PROGRAM KITCHENER K7O INDUCED INFILTRATION WELL
SUMMARY TABLE OF RESULTS (1990)

SCAN PARAMETER	RAW TOTAL	POSITIVE	TRACE
VOLATILES			
BENZENE	5	0	0
TOLUENE	5	0	0
ETHYLBENZENE	5	0	3
P-XYLENE	5	0	0
M-XYLENE	5	0	0
O-XYLENE	5	0	0
STYRENE	5	0	4
1,1 DICHLOROETHYLENE	5	0	0
METHYLENE CHLORIDE	5	0	0
T1,2DICHLOROETHYLENE	5	0	0
1,1 DICHLOROETHANE	5	0	0
CHLOROFORM	5	0	0
111, TRICHLOROETHANE	5	0	0
1,2 DICHLOROETHANE	5	0	0
CARBON TETRACHLORIDE	5	0	0
1,2 DICHLOROPROPANE	5	0	0
TRICHLOROETHYLENE	5	0	0
DICHLOROBROMOMETHANE	5	0	0
112 TRICHLOROETHANE	5	0	0
CHLORODIBROMOMETHANE	5	0	0
T-CHLOROETHYLENE	5	0	0
BROMOFORM	5	0	0
1122 T-CHLOROETHANE	5	0	0
CHLOROBENZENE	5	0	0
1,4 DICHLOROBENZENE	5	0	0
1,3 DICHLOROBENZENE	5	0	0
1,2 DICHLOROBENZENE	5	0	0
ETHLYENE DIBROMIDE	5	0	0
TOTL TRIHALOMETHANES	5	0	0
*TOTAL SCAN VOLATILES	145	0	7
*TOTAL GROUP ORGANIC	543	0	10

TABLE 4
DRINKING WATER SURVEILLANCE PROGRAM KITCHENER (STRANGE STREET RESERVOIR)
SUMMARY TABLE OF RESULTS (1990)

SCAN PARAMETER	TREATED TOTAL	POSITIVE	TRACE
BACTERIOLOGICAL			
STANDRD PLATE CNT MF	6	1	0
*TOTAL GROUP BACTERIOLOGICAL	6	1	0
CHEMISTRY (FLD)			
FLD CHLORINE (COMB)	6	6	0
FLD CHLORINE FREE	2	1	0
FLD CHLORINE (TOTAL)	6	6	0
FLD PH	6	6	0
FLD TEMPERATURE	6	6	0
*TOTAL SCAN CHEMISTRY (FLD)	26	25	0
CHEMISTRY (LAB)			
ALKALINITY	6	6	0
CALCIUM	6	6	0
CYANIDE	6	0	0
CHLORIDE	6	6	0
COLOUR	6	1	5
CONDUCTIVITY	6	6	0
DISS ORG CARBON	6	6	0
FLUORIDE	6	6	0
HARDNESS	6	6	0
IONCAL	6	6	0
LANGELIERS INDEX	6	6	0
MAGNESIUM	6	6	0
SODIUM	6	6	0
AMMONIUM TOTAL	6	1	0
NITRITE	6	1	4
TOTAL NITRATES	6	6	0
NITROGEN TOT KJELD	6	4	2
PH	6	6	0
PHOSPHORUS FIL REACT	6	1	4
PHOSPHORUS TOTAL	6	1	5
SULPHATE	6	6	0
TURBIDITY	6	4	2
*TOTAL SCAN CHEMISTRY (LAB)	132	97	22
METALS			
SILVER	6	0	0
ALUMINUM	6	6	0

TABLE 4
DRINKING WATER SURVEILLANCE PROGRAM KITCHENER (STRANGE STREET RESERVOIR)
SUMMARY TABLE OF RESULTS (1990)

SCAN PARAMETER	TREATED TOTAL	POSITIVE	TRACE
ARSENIC	6	1	4
BARIUM	6	6	0
BORON	6	6	0
BERYLLIUM	6	0	2
CADMIUM	6	0	1
COBALT	6	0	4
CHROMIUM	6	2	3
COPPER	6	0	6
IRON	6	6	0
MERCURY	6	0	0
MANGANESE	6	6	0
MOLYBDENUM	6	4	2
NICKEL	6	0	1
LEAD	6	0	6
ANTIMONY	6	0	6
SELENIUM	6	0	6
STRONTIUM	6	6	0
TITANIUM	6	6	0
THALLIUM	6	0	0
URANIUM	6	6	0
VANADIUM	6	1	4
ZINC	6	6	0
*TOTAL SCAN METALS	144	62	45
*TOTAL GROUP INORGANIC & PHYSICAL	302	184	67
CHLOROAROMATICS			
HEXACHLOROBUTADIENE	6	0	0
123 TRICHLOROBENZENE	6	0	0
1234 T-CHLOROBENZENE	6	0	0
1235 T-CHLOROBENZENE	6	0	0
124 TRICHLOROBENZENE	6	0	0
1245 T-CHLOROBENZENE	6	0	0
135 TRICHLOROBENZENE	6	0	0
HCB	6	0	0
HEXACHLOROETHANE	6	0	0
OCTACHLOROSTYRENE	6	0	0
PENTACHLOROBENZENE	6	0	0
236 TRICHLOROTOLUENE	6	0	0
245 TRICHLOROTOLUENE	6	0	0
26A TRICHLOROTOLUENE	6	0	0
*TOTAL SCAN CHLOROAROMATICS	84	0	0
CHLOROPHENOLS			
234 TRICHLOROPHENOL	2	0	0
2345 T-CHLOROPHENOL	2	0	0
2356 T-CHLOROPHENOL	2	0	0
245-TRICHLOROPHENOL	2	0	0
246-TRICHLOROPHENOL	2	0	0

TABLE 4
DRINKING WATER SURVEILLANCE PROGRAM KITCHENER (STRANGE STREET RESERVOIR)
SUMMARY TABLE OF RESULTS (1990)

SCAN PARAMETER	TREATED TOTAL	POSITIVE	TRACE
PENTACHLOROPHENOL	2	0	0
*TOTAL SCAN CHLOROPHENOLS	12	0	0
PAH			
PHENANTHRENE	6	0	0
ANTHRACENE	5	0	0
FLUORANTHENE	6	0	0
PYRENE	6	0	0
BENZO(A)ANTHRACENE	6	0	0
CHRYSENE	6	0	0
DIMETH. BENZ(A)ANTHR	6	0	0
BENZO(E) PYRENE	6	0	D
BENZO(B) FLUORANTHEN	6	0	0
PERYLENE	6	0	0
BENZO(K) FLUORANTHEN	6	0	0
BENZO(A) PYRENE	6	0	0
BENZO(G,H,I) PERYLEN	6	0	0
DIBENZO(A,H) ANTHRAC	6	0	0
INDENO(1,2,3-C,D) PY	6	0	0
BENZO(B) CHRYSENE	6	0	D
CORONENE	6	0	0
*TOTAL SCAN PAH	101	0	0
PESTICIDES & PCB			
ALDRIN	6	0	0
ALPHA BHC	6	0	0
BETA BHC	6	0	0
LINDANE	6	0	0
ALPHA CHLORDANE	6	0	0
GAMMA CHLORDANE	6	0	0
DIELDRIN	6	0	0
METHOXYCHLOR	6	0	0
ENDOSULFAN 1	6	0	0
ENDOSULFAN II	6	0	0
ENDRIN	6	0	0
ENDOSULFAN SULPHATE	6	0	0
HEPTACHLOR EPOXIDE	6	0	0
HEPTACHLOR	6	0	0
MIREX	6	0	0
OXYCHLORDANE	6	0	0
OPDDT	6	0	0
PCB	6	0	0
DDD	6	0	0
PPDDE	6	0	0
PPDDT	6	0	0
AMETRINE	6	0	0
ATRAZINE	6	0	0
ATRATONE	6	0	0
CYANAZINE (BLADEX)	6	0	0

TABLE 4
DRINKING WATER SURVEILLANCE PROGRAM KITCHENER (STRANGE STREET RESERVOIR)
SUMMARY TABLE OF RESULTS (1990)

SCAN PARAMETER	TREATED TOTAL	POSITIVE	TRACE
DESETHYLATRAZINE	6	0	0
D-ETHYL SIMAZINE	5	0	0
PROMETONE	6	0	0
PROPAZINE	6	0	0
PROMETRYNE	6	0	0
METRIBUZIN (SENCOR)	6	0	0
SIMAZINE	6	0	0
ALACHLOR (LASSO)	6	0	0
METOLACHLOR	6	0	0
HEXACLCYCLOPENTADIEN	1	0	0
*TOTAL SCAN PESTICIDES & PCB	204	0	0
PHENOLICS			
PHENOLICS	6	0	1
*TOTAL SCAN PHENOLICS	6	0	1
SPECIFIC PESTICIDES			
TOXAPHENE	6	0	0
2,4,5-T	2	0	0
2,4-D	2	0	0
2,4-DB	2	0	0
2,4 D PROPIONIC ACID	2	0	0
DICAMBA	2	0	0
PICHLORAM	0	0	0
SILVEX	2	0	0
DIAZINON	2	0	0
DICHLOROVOS	2	0	0
CHLORPYRIFOS	2	0	0
ETHION	2	0	0
AZINPHOS-METHYL	0	0	0
MALATHION	2	0	0
MEVINPHOS	2	0	0
METHYL PARATHION	2	0	0
METHYLTRITHION	2	0	0
PARATHION	2	0	0
PHORATE	2	0	0
RELDAN	2	0	0
RONNEL	2	0	0
AMINOCARB	0	0	0
BENONYL	0	0	0
BUX	0	0	0
CARBOFURAN	2	0	0
CICP	2	0	0
DIALLATE	2	0	0
EPTAM	2	0	0
IPC	2	0	0
PROPOXUR	2	0	0
CARBARYL	2	0	0
BUTYLATE	2	0	0

TABLE 4
DRINKING WATER SURVEILLANCE PROGRAM KITCHENER (STRANGE STREET RESERVOIR)
SUMMARY TABLE OF RESULTS (1990)

SCAN PARAMETER	TREATED TOTAL	POSITIVE	TRACE
*TOTAL SCAN SPECIFIC PESTICIDES	58	0	0
VOLATILES			
BENZENE	6	0	1
TOLUENE	6	0	0
ETHYLBENZENE	6	0	4
P-XYLENE	6	0	0
M-XYLENE	6	0	0
O-XYLENE	6	0	0
STYRENE	6	0	5
1,1 DICHLOROETHYLENE	6	0	0
METHYLENE CHLORIDE	6	0	0
T1,2DICHLOROETHYLENE	6	0	0
1,1 DICHLOROETHANE	6	0	2
CHLOROFORM	6	0	6
111, TRICHLOROETHANE	6	6	0
1,2 DICHLOROETHANE	6	0	0
CARBON TETRACHLORIDE	6	0	0
1,2 DICHLOROPROPANE	6	0	0
TRICHLOROETHYLENE	6	0	6
DICHLOROBROMOMETHANE	6	5	1
112 TRICHLOROETHANE	6	0	0
CHLORODIBROMOMETHANE	6	5	1
T-CHLOROETHYLENE	6	0	2
BROMOFORM	6	3	3
1122 T-CHLOROETHANE	6	0	0
CHLOROBENZENE	6	0	0
1,4 DICHLOROBENZENE	6	0	0
1,3 DICHLOROBENZENE	6	0	0
1,2 DICHLOROBENZENE	6	0	0
ETHLYENE DIBROMIDE	6	0	0
TOTL TRIHALOMETHANES	6	3	3
*TOTAL SCAN VOLATILES	174	22	34
*TOTAL GROUP ORGANIC	639	22	35

KEY TO TABLE 5 and 6

A ONTARIO DRINKING WATER OBJECTIVES (ODWO)
1. Maximum Acceptable Concentration (MAC)
1+. MAC for Total Trihalomethanes
2. Interim Maximum Acceptable Concentration (IMAC)
3. Aesthetic Objective (AO)
3*. AO for Total Xylenes
4. Recommended Operational Guideline

B HEALTH & WELFARE CANADA (H&W)
1. Maximum Acceptable Concentration (MAC)
2. Proposed MAC
3. Interim MAC
4. Aesthetic Objective (AO)

C WORLD HEALTH ORGANIZATION (WHO)
1. Guideline Value (GV)
2. Tentative GV
3. Aesthetic GV

D US ENVIRONMENTAL PROTECTION AGENCY (EPA)
1. Maximum Contaminant Level (MCL)
2. Suggested No-Adverse Effect Level (SNAEL)
3. Lifetime Health Advisory
4. EPA Ambient Water Quality Criteria
4T. EPA Ambient Water Quality Criteria for Total PAH

F EUROPEAN ECONOMIC COMMUNITY (EEC)
1. Health Related Guideline Level
2. Aesthetic Guideline Level
3. Maximum Admissable Concentration (MADC)

G CALIFORNIA STATE DEPARTMENT OF HEALTH-GUIDELINE VALUE

I NEW YORK STATE AMBIENT WATER GUIDELINE

N/A NONE AVAILABLE

LABORATORY RESULTS, REMARK DESCRIPTIONS

.	No Sample Taken
BDL	Below Minimum Measurement Amount
<T	Greater Than Detection Limit But Not Confident (SEE INTERPRETATION OF RESULTS ABOVE)
>	Results Are Greater Than The Upper Limit
<=>	Approximate Result
!CS	No Data: Contamination Suspected
!IL	No Data: Sample Incorrectly Labelled
!IS	No Data: Insufficient Sample
!IV	No Data: Inverted Septum
!LA	No Data: Laboratory Accident
!LD	No Data: Test Queued After Sample Discarded
!NA	No Data: No Authorization To Perform Reanalysis
!NP	No Data: No Procedure
!NR	No Data: Sample Not Received
!OP	No Data: Obscured Plate
!QU	No Data: Quality Control Unacceptable
!PE	No Data: Procedural Error - Sample Discarded
!PH	No Data: Sample pH Outside Valid Range
!RE	No Data: Received Empty
!RO	No Data: See Attached Report (no numeric results)
!SM	No Data: Sample Missing
!SS	No Data: Send Separate Sample Properly Preserved
!UI	No Data: Indeterminant Interference
!TX	No Data: Time Expired
A3C	Approximate, Total Count Exceeded 300 Colonies
APL	Additional Peak, Large, Not Priority Pollutant
APS	Additional Peak, Less Than, Not Priority Pollutant
CIC	Possible Contamination, Improper Cap
CRO	Calculated Result Only
PPS	Test Performed On Preserved Sample
RMP	P and M-Xylene Not Separated
RRV	Rerun Verification
RVU	Reported Value Unusual
SPS	Several Peaks, Small, Not Priority Pollutant

UCR	Unreliable: Could Not Confirm By Reanalysis
UCS	Unreliable: Contamination Suspected
UIN	Unreliable: Indeterminate Interference
XP	Positive After X Number Of Hours
T#	(T06) Result Taken After # Hours

TABLE 5

DRINKING WATER SURVEILLANCE PROGRAM KITCHENER WELL SUPPLY 1990

	K21 RAW	MANNHEIM RESERVOIR	SITE 1	STRANGE ST RESERVOIR		K70 RAW
			STANDING	FREE FLOW		
BACTERIOLOGICAL						
FECAL COLIFORM MF (CT/100ML)		DET'N LIMIT = 0		GUIDELINE = 0 (A1)		
JAN	0	.	.	.	.	0
MAR	0	.	.	.	.	.
MAY	0	.	.	.	.	0
JUL	0	.	.	.	.	0
SEP	0	.	.	.	.	0
NOV	0	.	.	.	.	0
STANDRD PLATE CNT MF (CT/ML)		DET'N LIMIT = 0		GUIDELINE = 500/ML (A1)		
JAN	.	1 <=>	.	1 <=>	0 <=>	.
MAR	.	32	.	11	41	.
MAY	.	0 <=>	.	1 <=>	0 <=>	.
JUL	.	0 <=>	.	3 <=>	1 <=>	.
SEP	.	1 <=>	.	0 <=>	1 <=>	.
NOV	.	0 <=>	.	0 <=>	1 <=>	.
TOTAL COLIFORM MF (CT/100ML)		DET'N LIMIT = 0		GUIDELINE = 5/100ML(A1)		
JAN	0	.	.	.	.	2
MAR	0	.	.	.	.	.
MAY	0	.	.	.	.	0
JUL	0	.	.	.	.	0
SEP	0	.	.	.	.	0
NOV	0	.	.	.	.	0
T COLIFORM BCKGRD MF (CT/100ML)		DET'N LIMIT = 0		GUIDELINE = N/A		
JAN	0	.	.	.	.	0
MAR	0	.	.	.	.	.
MAY	0	.	.	.	.	0
JUL	0	.	.	.	.	0
SEP	0	.	.	.	.	0
NOV	0	.	.	.	.	0

TABLE 5

DRINKING WATER SURVEILLANCE PROGRAM KITCHENER WELL SUPPLY 1990

	K21 RAW	MANNHEIM RESERVOIR	SITE 1		STRANGE ST RESERVOIR	K70 RAW
			STANDING	FREE FLOW		
CHEMISTRY (FLD)						
FLD CHLORINE (COMB) (MG/L)		DET'N LIMIT = 0		GUIDELINE = N/A		
JAN	.	.100	.000	.000	.100	.
MAR	.	.200	.000	.000	.100	.
MAY	.	.100	.000	.000	.100	.
JUL	.	.100	.000	.000	.100	.
SEP	.	.000	.	.100	.100	.
NOV	.	.100	.000	.100	.100	.
FLD CHLORINE FREE (MG/L)		DET'N LIMIT = 0		GUIDELINE = N/A		
JAN	.	.	.000	.000	.	.
MAR	.	.100	.000	.000	.	.
MAY	.	.100	.000	.000	.100	.
JUL	.	.	.000	.000	.	.
SEP	.	.000	.	.000	.	.
NOV	.	.000	.000	.100	.000	.
FLD CHLORINE (TOTAL) (MG/L)		DET'N LIMIT = N/A		GUIDELINE = 0		
JAN	.	.100	.000	.000	.100	.
MAR	.	.200	.000	.000	.100	.
MAY	.	.200	.000	.000	.200	.
JUL	.	.100	.000	.000	.100	.
SEP	.	.000	.	.100	.100	.
NOV	.	.100	.000	.200	.100	.
FLD PH (DMNSLESS)		DET'N LIMIT = N/A		GUIDELINE = 6.5-8.5(A4)		
JAN	7.300	7.500	7.600	7.500	7.100	7.500
MAR	7.500	7.500	7.600	7.500	7.300	.
MAY	7.400	7.500	7.500	7.500	7.300	7.500
JUL	7.400	7.500	7.400	7.400	7.200	7.500
SEP	7.300	7.500	7.500	7.400	7.100	7.500
NOV	7.500	7.500	7.600	7.600	7.300	7.500

TABLE 5

DRINKING WATER SURVEILLANCE PROGRAM KITCHENER WELL SUPPLY 1990

	K21 RAW	MANNHEIM RESERVOIR	SITE 1		STRANGE ST RESERVOIR	K70 RAW
			STANDING	FREE FLOW		
FLD TEMPERATURE (DEG.C)		DET'N LIMIT = N/A		GUIDELINE = 15 (A3)		
JAN	8.000	8.000	15.000	8.000	9.000	8.000
MAR	9.000	8.000	13.000	8.000	9.000	.
MAY	9.000	8.000	16.000	12.000	11.000	9.000
JUL	9.000	11.000	18.000	14.000	11.000	15.000
SEP	8.000	10.000	17.000	14.000	10.000	12.000
NOV	9.000	9.000	16.000	13.000	9.000	13.000

TABLE 5

DRINKING WATER SURVEILLANCE PROGRAM KITCHENER WELL SUPPLY 1990

	K21 RAW	MANNHEIM RESERVOIR	SITE 1		STRANGE ST RESERVOIR	K70 RAW
			STANDING	FREE FLOW		
CHEMISTRY (LAB)						
ALKALINITY (MG/L)		DET'N LIMIT = 0.20		GUIDELINE = 30-500 (A3)		
JAN	282.900	273.100	235.800	230.000	329.400	226.500
MAR	273.500	267.400	261.300	262.500	312.200	.
MAY	277.200	267.700	275.700	267.100	332.000	230.300
JUL	243.300	217.500	234.500	222.600	256.400	215.900
SEP	275.100	261.900	258.100	305.300	315.000	210.500
NOV	283.000	273.700	273.400	272.500	322.000	231.000
CALCIUM (MG/L)		DET'N LIMIT = 0.20		GUIDELINE = 100 (F2)		
JAN	92.200	97.600	78.400	76.900	134.000	79.200
MAR	91.600	95.000	96.200	95.200	136.000	.
MAY	88.800	94.100	94.500	93.000	127.500	76.900
JUL	81.400	81.000	118.400	97.900	111.700	74.100
SEP	84.800	89.000	84.800	131.000	125.000	71.000
NOV	94.400	95.400	94.800	93.800	137.000	75.600
CHLORIDE (MG/L)		DET'N LIMIT = 0.20		GUIDELINE = 250 (A3)		
JAN	16.400	19.800	19.700	20.100	89.400	40.500
MAR	16.600	21.000	21.200	21.000	98.600	.
MAY	16.900	21.600	21.700	21.500	94.800	30.000
JUL	17.300	21.500	106.000	65.000	96.100	34.500
SEP	17.200	20.700	28.700	142.000	99.400	34.000
NOV	32.100	33.300	32.100	33.800	98.600	28.500
COLOUR (HZU)		DET'N LIMIT = .500		GUIDELINE = 5 (A3)		
JAN	BDL	.500 <T	BDL	BDL	1.000 <T	5.000
MAR	BDL	BDL	BDL	BDL	2.000 <T	.
MAY	BDL	.500 <T	1.000 <T	1.000 <T	4.000	6.000
JUL	-	.500 <T	6.500	1.500 <T	2.000 <T	7.000
SEP	.500 <T	.500 <T	1.500 <T	4.500	2.000 <T	8.000
NOV	BDL	BDL	BDL	BDL	1.500 <T	5.500

TABLE 5

DRINKING WATER SURVEILLANCE PROGRAM KITCHENER WELL SUPPLY 1990

	K21 RAW	MANNHEIM RESERVOIR	SITE 1		STRANGE ST RESERVOIR	K70 RAW
			STANDING	FREE FLOW		
CONDUCTIVITY (UMHO/CM)		DET'N LIMIT = 1.00		GUIDELINE = 400 (F2)		
JAN	650	664	661	663	1049	656
MAR	631	652	645	646	1053	.
MAY	637	659	672	657	1086	600
JUL	642	659	1161	918	1067	578
SEP	600	628	670	1162	1027	548
NOV	651	652	652	652	1085	584
DISS ORG CARBON (MG/L)		DET'N LIMIT = 0.10		GUIDELINE = 5.0 (A3)		
JAN	.500	.600	.600	.600	1.100	2.900
MAR	.500	.500	.600	.500	1.100	.
MAY	.500	.600	.700	.500	1.000	2.400
JUL	.500	.700	1.500	1.000	1.100	2.700
SEP	.500	.600	.700	1.300	1.100	2.700
NOV	.500	.500	.900	.500	.900	2.600
FLUORIDE (MG/L)		DET'N LIMIT = 0.01		GUIDELINE = 2.4 (A1)		
JAN	.100	.080	.080	.080	.080	.120
MAR	.100	.080	.080	.080	.100	.
MAY	.120	.080	.080	.080	.100	.120
JUL	.100	.080	.100	.100	.080	.140
SEP	.100	.080	.080	.100	.080	.140
NOV	.100	.080	.060	.080	.080	.120
HARDNESS (MG/L)		DET'N LIMIT = 0.50		GUIDELINE = 80-100 (A4)		
JAN	346.000	353.000	301.600	298.300	488.000	292.000
MAR	345.000	345.000	348.000	346.000	493.000	.
MAY	336.200	342.600	346.400	340.000	475.100	281.800
JUL	317.500	306.800	468.100	385.200	435.800	269.200
SEP	326.000	329.000	325.000	500.000	466.000	258.000
NOV	352.000	347.000	343.000	342.000	500.000	277.000

TABLE 5

DRINKING WATER SURVEILLANCE PROGRAM KITCHENER WELL SUPPLY 1990

	K21 RAW	MANNHEIM RESERVOIR	SITE 1		STRANGE ST RESERVOIR	K70 RAW
			STANDING	FREE FLOW		
IONCAL (DMNSLESS)		DET'N LIMIT = N/A		GUIDELINE = N/A		
JAN	.508	1.295	2.043	1.421	2.151	.606
MAR	3.037	.783	3.498	2.712	3.844	.
MAY	.979	.560	2.598	.886	1.152	1.273
JUL	3.920	4.764	4.320	3.736	5.061	1.573
SEP	3.338	2.914	6.531	5.065	.594	1.213
NOV	3.856	4.637	4.607	5.417	4.253	1.497
LANGELIERS INDEX (DMNSLESS)		DET'N LIMIT = N/A		GUIDELINE = N/A		
JAN	1.163	1.241	1.103	1.053	1.302	1.060
MAR	1.216	1.241	1.247	1.274	1.255	.
MAY	1.128	1.157	1.191	1.111	1.222	1.048
JUL	1.013	.992	.945	1.001	1.013	.946
SEP	1.087	1.055	.975	1.013	1.113	.949
NOV	1.383	1.403	1.420	1.374	1.410	1.203
MAGNESIUM (MG/L)		DET'N LIMIT = 0.10		GUIDELINE = 30 (F2)		
JAN	28.200	26.400	25.800	25.800	37.200	22.900
MAR	28.300	26.200	26.300	26.400	37.500	.
MAY	27.800	26.150	26.800	26.150	38.100	21.850
JUL	27.750	25.400	41.900	34.200	38.100	20.400
SEP	27.800	26.000	27.400	42.000	37.600	19.600
NOV	28.200	26.400	25.900	26.100	38.600	21.500
SODIUM (MG/L)		DET'N LIMIT = 0.20		GUIDELINE = 200 (A4)		
JAN	9.600	9.400	9.600	9.800	41.400	24.000
MAR	8.800	9.200	9.400	9.200	45.600	.
MAY	9.100	9.700	10.000	9.800	45.900	17.300
JUL	9.300	10.200	53.700	32.400	45.400	19.900
SEP	8.800	8.200	13.800	62.200	47.800	20.400
NOV	9.400	9.000	9.400	9.400	45.000	15.600

TABLE 5

DRINKING WATER SURVEILLANCE PROGRAM KITCHENER WELL SUPPLY 1990

	K21 RAW	MANNHEIM RESERVOIR	SITE 1 STANDING	SITE 1 FREE FLOW	STRANGE ST RESERVOIR	K70 RAW
AMMONIUM TOTAL (MG/L)		DET'N LIMIT = 0.002		GUIDELINE = .05 (F2)		
JAN	BDL	BDL	BDL	BDL	BDL	BDL
MAR	BDL	BDL	BDL	BDL	BDL	.
MAY	BDL	BDL	BDL	BDL	BDL	BDL
JUL	.020	BDL	BDL	.004 <T	.170	.020
SEP	BDL	BDL	BDL	.074	BDL	.026
NOV	BDL	BDL	BDL	BDL	BDL	BDL
NITRITE (MG/L)		DET'N LIMIT = 0.001		GUIDELINE = 1 (A1)		
JAN	.006	BDL	.001 <T	BDL	.001 <T	.001 <T
MAR	.005	BDL	BDL	BDL	BDL	.
MAY	.009	.004 <T	.005	.004 <T	.002 <T	.002 <T
JUL	.003 <T	.001 <T	.005	.002 <T	.005	.002 <T
SEP	.008	.006	.004 <T	.006	.001 <T	.005
NOV	.004 <T	BDL	.001 <T	.001 <T	.002 <T	.011
TOTAL NITRATES (MG/L)		DET'N LIMIT = 0.005		GUIDELINE = 10 (A1)		
JAN	.610	3.580	3.590	3.570	.370	2.510
MAR	.565	3.470	3.500	3.490	.440	.
MAY	.510	3.870	3.870	3.800	.445	1.980
JUL	.505	2.600	.240	1.380	.355	.465
SEP	.420	3.410	2.930	.140	.390	.165
NOV	.430	3.040	3.070	3.050	.425	1.270
NITROGEN TOT KJELD (MG/L)		DET'N LIMIT = .020		GUIDELINE = N/A		
JAN	.020 <T	.040 <T	.060 <T	.060 <T	.040 <T	.260
MAR	.050 <T	.140	.150	.110	.100	.
MAY	.200	.270	.210	.270	.560	.350
JUL	.060 <T	.100	.180	.180	.130	.300
SEP	.040 <T	.090 <T	.090 <T	.150	.100	.270
NOV	BDL	.040 <T	.100	.050 <T	.040 <T	.280

TABLE 5

DRINKING WATER SURVEILLANCE PROGRAM KITCHENER WELL SUPPLY 1990

	K21 RAW	MANNHEIM RESERVOIR	SITE 1		STRANGE ST RESERVOIR	K70 RAW
			STANDING	FREE FLOW		
PH (DMNSLESS)		DET'N LIMIT = N/A		GUIDELINE = 6.5-8.5(A4)		
JAN	8.220	8.290	8.310	8.280	8.150	8.280
MAR	8.290	8.310	8.320	8.350	8.120	.
MAY	8.210	8.230	8.250	8.190	8.090	8.270
JUL	8.190	8.220	8.000	8.150	8.050	8.210
SEP	8.190	8.160	8.110	7.910	8.010	8.240
NOV	8.430	8.460	8.480	8.440	8.260	8.430
PHOSPHORUS FIL REACT (MG/L)		DET'N LIMIT = 0.0005		GUIDELINE = N/A		
JAN	.001 <T	.001 <T	.	.	.001 <T	.001 <T
MAR	.001 <T	.001 <T	.	.	.001 <T	.
MAY	.001 <T	.001 <T	.	.	.002	.002
JUL	.001 <T	.001 <T	.	.	.000 <T	.002 <T
SEP	BDL	BDL	.	.	BDL	BDL
NOV	.001 <T	.001 <T	.	.	.001 <T	.001 <T
PHOSPHORUS TOTAL (MG/L)		DET'N LIMIT = 0.002		GUIDELINE = .40 (F2)		
JAN	.003 <T	BDL	.	.	.003 <T	.003 <T
MAR	.004 <T	.003 <T	.	.	.009 <T	.
MAY	.004 <T	.007 <T	.	.	.015	.011
JUL	.002 <T	.002 <T	.	.	.005 <T	.005 <T
SEP	BDL	BDL	.	.	.003 <T	.005 <T
NOV	BDL	BDL	.	.	.003 <T	.004 <T
SULPHATE (MG/L)		DET'N LIMIT = 0.20		GUIDELINE = 500 (A3)		
JAN	54.800	52.020	50.850	50.800	104.400	51.520
MAR	52.450	50.650	50.570	49.980	113.560	.
MAY	54.290	51.560	55.120	51.210	109.760	42.160
JUL	53.280	54.600	168.760	115.250	111.430	39.600
SEP	53.720	51.740	65.890	155.160	112.940	38.120
NOV	54.420	49.740	48.740	48.520	107.300	38.430

TABLE 5

ORINKING WATER SURVEILLANCE PROGRAM KITCHENER WELL SUPPLY 1990

	K21 RAW	MANKHEIM RESERVOIR	SITE 1		STRANGE ST RESERVOIR	K70 RAW
			STANDING	FREE FLOW		
TURBIDITY (FTU)		DET'N LIMIT = 0.05		GUIDELINE = 1 (A1)		
JAN	.120 <T	.200 <T	.220 <T	.150 <T	.200 <T	.190 <T
MAR	.490	.250	.530	.380	.370	.
MAY	.530	.920	.230	.750	.800	.720
JUL	.140 <T	.260	1.900 RRV	.400	.240 <T	.090 <T
SEP	.400	.200 <T	1.400 RRV	1.200 RRV	.350	.180 RRV
NOV	.270	.290	.680	.340	.530	.260

TABLE 5

DRINKING WATER SURVEILLANCE PROGRAM KITCHENER WELL SUPPLY 1990

	K21 RAW	MANNHEIM RESERVOIR	SITE 1 STANDING	SITE 1 FREE FLOW	STRANGE ST RESERVOIR	K70 RAW
METALS						
ALUMINUM (UG/L)		DET'N LIMIT = 0.10		GUIDELINE = 100 (A4)		
JAN	5.900	3.500	3.500	3.300	5.900	3.300
MAR	7.400	4.700	5.800	5.400	6.400	.
MAY	4.900	4.600	5.700	4.800	4.800	3.300
JUL	6.100	4.900	7.000	5.500	5.900	3.800
SEP	3.800	3.600	4.200	4.300	4.900	3.500
NOV	1.400	1.600	2.400	1.600	1.300	1.500
ARSENIC (UG/L)		DET'N LIMIT = 0.10		GUIDELINE = 25 (A1)		
JAN	.250 <T	.240 <T	.370 <T	.310 <T	.950 <T	.440 <T
MAR	.360 <T	.360 <T	.500 <T	.420 <T	.690 <T	.
MAY	.200 <T	.210 <T	.260 <T	.240 <T	.410 <T	BDL
JUL	.380 <T	.510 <T	1.800	.680 <T	1.000 <T	.420 <T
SEP	.180 <T	.210 <T	.580 <T	1.600	1.100	.260 <T
NOV	.640 <T	.570 <T	.750 <T	.670 <T	BDL	.180 <T
BARIUM (UG/L)		DET'N LIMIT = 0.05		GUIDELINE = 1000 (A2)		
JAN	120.000	120.000	100.000	110.000	130.000	26.000
MAR	100.000	110.000	100.000	110.000	130.000	.
MAY	110.000	100.000	100.000	97.000	120.000	24.000
JUL	110.000	110.000	130.000	110.000	130.000	26.000
SEP	110.000	100.000	90.000	110.000	120.000	24.000
NOV	100.000	99.000	95.000	100.000	120.000	25.000
BORON (UG/L)		DET'N LIMIT = 2.00		GUIDELINE = 5000 (A1)		
JAN	13.000 <T	10.000 <T	10.000 <T	10.000 <T	26.000	20.000 <T
MAR	53.000	15.000 <T	29.000	32.000	54.000	.
MAY	12.000 <T	13.000 <T	14.000 <T	11.000 <T	31.000	25.000
JUL	35.000	28.000	50.000	40.000	53.000	29.000
SEP	17.000 <T	51.000	21.000	72.000	79.000	54.000
NOV	17.000 <T	12.000 <T	16.000 <T	15.000 <T	36.000	30.000

TABLE 5

DRINKING WATER SURVEILLANCE PROGRAM KITCHENER WELL SUPPLY 1990

	K21 RAW	MANNHEIM RESERVOIR	SITE 1 STANDING	SITE 1 FREE FLOW	STRANGE ST RESERVOIR	K70 RAW
BERYLLIUM (UG/L)		DET'N LIMIT = 0.05		GUIDELINE = 6800 (D4)		
JAN	BDL	BDL	BDL	BDL	BDL	BDL
MAR	.070 <T	BDL	BDL	.080 <T	.060 <T	.
MAY	BDL	BDL	BDL	BDL	BDL	BDL
JUL	BDL	BDL	BDL	BDL	BDL	BDL
SEP	BDL	.080 <T	BDL	.120 <T	.110 <T	.080 <T
NOV	BDL	BDL	BDL	BDL	BDL	BDL
CADMIUM (UG/L)		DET'N LIMIT = 0.05		GUIDELINE = 5 (A1)		
JAN	BDL	BDL	BDL	BDL	BDL	BDL
MAR	BDL	BDL	.080 <T	BDL	BDL	.
MAY	BDL	BDL	BDL	BDL	BDL	BDL
JUL	BDL	BDL	.120 <T	BDL	BDL	BDL
SEP	BDL	BDL	BDL	BDL	BDL	BDL
NOV	BDL	BDL	.110 <T	BDL	.080 <T	BDL
COBALT (UG/L)		DET'N LIMIT = 0.02		GUIDELINE = N/A		
JAN	.500 <T	.490 <T	.500 <T	.480 <T	.030 <T	BDL
MAR	BDL	BDL	BDL	BDL	BDL	.
MAY	BDL	BDL	BDL	BDL	BDL	BDL
JUL	.240 <T	.290 <T	.470 <T	.310 <T	.730 <T	.300 <T
SEP	BDL	BDL	.130 <T	.140 <T	.490 <T	.180 <T
NOV	.190 <T	.130 <T	.230 <T	.200 <T	.150 <T	.030 <T
CHROMIUM (UG/L)		DET'N LIMIT = 0.50		GUIDELINE = 50 (A1)		
JAN	BDL	BDL	BDL	BDL	BDL	BDL
MAR	6.400	1.500 <T	5.700	6.200	7.900	.
MAY	BDL	.510 <T	BDL	BDL	1.100 <T	1.500 <T
JUL	3.300 <T	2.600 <T	3.200 <T	3.000 <T	3.800 <T	.930 <T
SEP	.720 <T	6.200	1.600 <T	8.100	8.200	5.600
NOV	1.900 <T	1.200 <T	1.800 <T	1.900 <T	1.300 <T	2.400 <T

TABLE 5

DRINKING WATER SURVEILLANCE PROGRAM KITCHENER WELL SUPPLY 1990

	K21 RAW	MANNHEIM RESERVOIR	SITE 1 STANDING	SITE 1 FREE FLOW	STRANGE ST RESERVOIR	K70 RAW
COPPER (UG/L)		DET'N LIMIT = 0.50		GUIDELINE = 1000 (A3)		
JAN	.820 <T	1.700 <T	70.000	8.600	2.000 <T	3.800 <T
MAR	.720 <T	1.600 <T	38.000	7.400	1.600 <T	.
MAY	.720 <T	1.600 <T	48.000	6.800	2.400 <T	3.300 <T
JUL	1.000 <T	33.000	69.000	12.000	1.800 <T	4.400 <T
SEP	.940 <T	37.000	83.000	12.000	1.800 <T	4.400 <T
NOV	BDL	31.000	46.000	6.100	1.800 <T	3.700 <T
IRON (UG/L)		DET'N LIMIT = 6.00		GUIDELINE = 300 (A3)		
JAN	BDL	8.600 <T	8.000 <T	6.300 <T	120.000	6.500 <T
MAR	BDL	12.000 <T	11.000 <T	BDL	96.000	.
MAY	BDL	BDL	8.900 <T	47.000 <T	110.000	BDL
JUL	BDL	8.800 <T	910.000	85.000	110.000	BDL
SEP	13.000 <T	BDL	200.000	400.000	110.000	BDL
NOV	BDL	12.000 <T	12.000 <T	20.000 <T	100.000	BDL
MERCURY (UG/L)		DET'N LIMIT = 0.02		GUIDELINE = 1 (A1)		
JAN	.040 <T	.020 <T	.	.	BDL	BDL
MAR	BDL	BDL	.	.	BDL	.
MAY	.040 <T	BDL	.	.	BDL	BDL
JUL	BDL	BDL	.	.	BDL	.040 <T
SEP	BDL	BDL	.	.	BDL	BDL
NOV	BDL	BDL	.	.	BDL	.040 <T
MANGANESE (UG/L)		DET'N LIMIT = 0.05		GUIDELINE = 50 (A3)		
JAN	13.000	12.000	13.000	4.700	110.000	.430 <T
MAR	12.000	13.000	9.800	4.200	120.000	.
MAY	12.000	7.400	15.000	9.500	110.000	1.600
JUL	9.700	11.000	140.000	90.000	110.000	21.000
SEP	12.000	7.000	70.000	250.000	110.000	79.000
NOV	11.000	5.900	7.800	5.900	100.000	54.000

TABLE 5

DRINKING WATER SURVEILLANCE PROGRAM KITCHENER WELL SUPPLY 1990

	K21 RAW	MANNHEIM RESERVOIR	SITE 1		STRANGE ST RESERVOIR	K70 RAW
			STANDING	FREE FLOW		
MOLYBDENUM (UG/L)		DET'N LIMIT = 0.05		GUIDELINE = N/A		
JAN	.670	.570	.590	.500 <T	.490 <T	.800
MAR	.720	.390 <T	.470 <T	.540	.600	.
MAY	.500 <T	.520	.430 <T	.490 <T	.470 <T	.570
JUL	.690	.600	.440 <T	.610	.530	1.200
SEP	.660	.600	.600	.600	.530	1.800
NOV	.670	.440 <T	.450 <T	.430 <T	.520	1.200
NICKEL (UG/L)		DET'N LIMIT = 0.20		GUIDELINE = 350 (D3)		
JAN	1.100 <T	2.100	4.300	1.700 <T	BDL	.490 <T
MAR	BDL	BDL	BDL	BDL	BDL	.
MAY	BDL	BDL	BDL	BDL	BDL	BDL
JUL	BDL	BDL	BDL	BDL	BDL	BDL
SEP	1.200 <T	2.100	7.100	2.300	1.900 <T	2.000 <T
NOV	BDL	BDL	2.000 <T	BDL	BDL	BDL
LEAD (UG/L)		DET'N LIMIT = 0.05		GUIDELINE = 10. (A1)		
JAN	.070 <T	BDL	1.600	.150 <T	.060 <T	.090 <T
MAR	.090 <T	.070 <T	.840	.170 <T	.070 <T	.
MAY	.130 <T	BDL	1.100	.170 <T	.290 <T	.060 <T
JUL	.090 <T	.350 <T	3.400	.210 <T	.100 <T	.230 <T
SEP	.070 <T	.220 <T	3.700	.200 <T	.090 <T	.110 <T
NOV	BDL	.220 <T	1.600	.270 <T	.070 <T	1.400
ANTIMONY (UG/L)		DET'N LIMIT = 0.05		GUIDELINE = 146 (D4)		
JAN	.360 <T	.300 <T	.400 <T	.310 <T	.250 <T	.260 <T
MAR	.280 <T	.370 <T	.460 <T	.310 <T	.300 <T	.
MAY	.440 <T	.340 <T	.490 <T	.360 <T	.370 <T	.350 <T
JUL	.400 <T	.480 <T	.440 <T	.510	.420 <T	.340 <T
SEP	.400 <T	.360 <T	.600	.420 <T	.410 <T	.420 <T
NOV	.380 <T	.320 <T	.430 <T	.300 <T	.370 <T	.430 <T

TABLE 5

DRINKING WATER SURVEILLANCE PROGRAM KITCHENER WELL SUPPLY 1990

	K21 RAW	MANNHEIM RESERVOIR	SITE 1 STANDING	SITE 1 FREE FLOW	STRANGE ST RESERVOIR	K70 RAW
SELENIUM (UG/L)		DET'N LIMIT = 1.00		GUIDELINE = 10 (A1)		
JAN	BDL	BDL	BDL	BDL	1.400 <T	BDL
MAR	BDL	BDL	BDL	BDL	1.100 <T	.
MAY	BDL	1.100 <T	BDL	BDL	1.100 <T	BDL
JUL	BDL	BDL	1.900 <T	BDL	1.100 <T	BDL
SEP	BDL	BDL	BDL	1.400 <T	1.800 <T	BDL
NOV	BDL	BDL	BDL	BDL	1.600 <T	BDL
STRONTIUM (UG/L)		DET'N LIMIT = 0.10		GUIDELINE = N/A		
JAN	260.000	200.000	210.000	200.000	630.000	530.000
MAR	240.000	210.000	220.000	230.000	740.000	.
MAY	250.000	200.000	430.000	220.000	710.000	530.000
JUL	240.000	190.000	1100.000	760.000	680.000	480.000
SEP	250.000	190.000	520.000	1100.000	720.000	460.000
NOV	250.000	190.000	200.000	190.000	690.000	450.000
TITANIUM (UG/L)		DET'N LIMIT = 0.50		GUIDELINE = N/A		
JAN	19.000	16.000	17.000	17.000	14.000	8.300
MAR	19.000	14.000	13.000	13.000	18.000	.
MAY	17.000	17.000	17.000	17.000	22.000	12.000
JUL	13.000	12.000	17.000	14.000	15.000	8.200
SEP	23.000	20.000	23.000	29.000	28.000	15.000
NOV	19.000	18.000	19.000	18.000	21.000	11.000
THALLIUM (UG/L)		DET'N LIMIT = 0.05		GUIDELINE = 13 (D4)		
JAN	BDL	BDL	BDL	BDL	BDL	BDL
MAR	BDL	BDL	BDL	BDL	BDL	.
MAY	BDL	BDL	BDL	BDL	BDL	BDL
JUL	BDL	BDL	.070 <T	BDL	BDL	BDL
SEP	BDL	BDL	BDL	BDL	BDL	BDL
NOV	BDL	BDL	BDL	BDL	BDL	BDL

TABLE 5

DRINKING WATER SURVEILLANCE PROGRAM KITCHENER WELL SUPPLY 1990

	K21 RAW	MANNHEIM RESERVOIR	SITE 1		STRANGE ST RESERVOIR	K70 RAW
			STANDING	FREE FLOW		
URANIUM (UG/L)		DET'N LIMIT = 0.05		GUIDELINE = 100 (A1)		
JAN	.800	1.000	.900	.970	1.300	.730
MAR	.780	.920	.970	.960	1.200	.
MAY	.760	.850	.830	.880	1.400	.580
JUL	.950	1.200	1.400	1.200	1.500	.540
SEP	.880	.990	1.100	1.300	1.500	.480 <T
NOV	.290 <T	1.000	.900	.900	1.600	.660
VANADIUM (UG/L)		DET'N LIMIT = 0.05		GUIDELINE = N/A		
JAN	.300 <T	.280 <T	.150 <T	.240 <T	.640	.420 <T
MAR	.300 <T	.170 <T	.190 <T	.220 <T	.340 <T	.
MAY	.250 <T	.130 <T	.110 <T	.140 <T	.140 <T	.120 <T
JUL	.250 <T	.170 <T	.260 <T	.270 <T	.330 <T	.230 <T
SEP	.350 <T	.250 <T	.270 <T	.440 <T	.420 <T	.250 <T
NOV	.230 <T	.070 <T	.060 <T	.080 <T	BDL	.150 <T
ZINC (UG/L)		DET'N LIMIT = 0.20		GUIDELINE = 5000 (A3)		
JAN	7.800	5.600	18.000	5.400	12.000	3.900
MAR	7.000	5.100	12.000	4.700	11.000	.
MAY	6.800	4.500	17.000	5.100	11.000	3.200
JUL	8.100	6.600	24.000	6.600	11.000	4.800
SEP	7.800	4.900	30.000	8.800	14.000	4.300
NOV	8.100	6.900	21.000	7.000	15.000	11.000

TABLE 5

DRINKING WATER SURVEILLANCE PROGRAM KITCHENER WELL SUPPLY 1990

	K21 RAW	MANNHEIM RESERVOIR	SITE 1		STRANGE ST RESERVOIR	K70 RAW
			STANDING	FREE FLOW		
CHLOROAROMATICS						
HEXACHLOROETHANE (NG/L)		DET'N LIMIT = 1.000		GUIDELINE = 1900 (D4)		
JAN	BDL	BDL	.	BDL	BDL	BDL
MAR	BDL	BDL	.	BDL	BDL	.
MAY	BDL	BDL	.	BDL	BDL	BDL
JUL	BDL	BDL	.	BDL	BDL	BDL
SEP	BDL	BDL	.	BDL	BDL	BDL
NOV	BDL	1.000 <T	.	BDL	BDL	BDL

TABLE 5

DRINKING WATER SURVEILLANCE PROGRAM KITCHENER WELL SUPPLY 1990

	K21 RAW	MANNHEIM RESERVOIR	SITE 1		STRANGE ST RESERVOIR	K70 RAW
			STANDING	FREE FLOW		
PESTICIDES & PCB						
ATRAZINE (NG/L)		DET'N LIMIT = 50.0		GUIDELINE = 60000 (A2)		
JAN	BDL	200.000 <T	.	.	BDL	BDL
MAR	BDL	BDL	.	.	BDL	.
MAY	BDL	BDL	.	.	BDL	200.000 <T
JUL	BDL	BDL	.	.	BDL	BDL
SEP	BDL	BDL	.	.	BDL	360.000 <T
NOV	BDL	BDL	.	.	BDL	470.000 <T

TABLE 5

DRINKING WATER SURVEILLANCE PROGRAM KITCHENER WELL SUPPLY 1990

	K21 RAW	MANNHEIM RESERVOIR	SITE 1		STRANGE ST RESERVOIR	K70 RAW
			STANDING	FREE FLOW		
PHENOLICS (UG/L PHENOLICS)		DET'N LIMIT = 0.20	GUIDELINE = 2 (A4)			
JAN	BDL	BDL	.	.	BDL	BDL
MAR	.400 <T	BDL	.	.	.600 <T	.
MAY	BDL	BDL	.	.	BDL	BDL
JUL	.600 <T	BDL	.	.	BDL	BDL
SEP	BDL	BDL	.	.	BDL	BDL
NOV	.600 <T	.600 <T	.	.	BDL	BDL

TABLE 5

DRINKING WATER SURVEILLANCE PROGRAM KITCHENER WELL SUPPLY 1990

	K21 RAW	MANNHEIM RESERVOIR	SITE 1 STANDING	SITE 1 FREE FLOW	STRANGE ST RESERVOIR	K70 RAW
VOLATILES						
BENZENE (UG/L)		DET'N LIMIT = 0.05		GUIDELINE = 5 (A1)		
JAN	BDL	BDL	.	BDL	BDL	BDL
MAR	BDL	.100 <T	.	.100 <T	.050 <T	.
MAY	BDL	BDL	.	BDL	BDL	BDL
JUL	BDL	.100 <T	.	.050 <T	BDL	BDL
SEP	BDL	BDL	.	.300 <T	BDL	BDL
NOV	BDL	BDL	.	BDL	BDL	BDL
TOLUENE (UG/L)		DET'N LIMIT = 0.05		GUIDELINE = 24 (A3)		
JAN	BDL	BDL	.	.050 <T	BDL	BDL
MAR	BDL	BDL	.	BDL	BDL	.
MAY	BDL	.050 <T	.	BDL	BDL	BDL
JUL	BDL	BDL	.	BDL	BDL	BDL
SEP	BDL	BDL	.	BDL	BDL	BDL
NOV	BDL	BDL	.	BDL	BDL	BDL
ETHYLBENZENE (UG/L)		DET'N LIMIT = 0.05		GUIDELINE = 2.4 (A3)		
JAN	BDL	BDL	.	BDL	BDL	BDL
MAR	.100 <T	.200 <T	.	.200 <T	.150 <T	.
MAY	.100 <T	.200 <T	.	.100 <T	.100 <T	.100 <T
JUL	BDL	.100 <T	.	.050 <T	.050 <T	.150 <T
SEP	.150 <T	BDL	.	BDL	BDL	BDL
NOV	.050 <T	.150 <T	.	.050 <T	.050 <T	.050 <T
M-XYLENE (UG/L)		DET'N LIMIT = 0.10		GUIDELINE = 300 (A3*)		
JAN	BDL	BDL	.	BDL	BDL	BDL
MAR	BDL	BDL	.	BDL	BDL	.
MAY	BDL	.200 <T	.	BDL	BDL	BDL
JUL	BDL	BDL	.	BDL	BDL	BDL
SEP	BDL	BDL	.	BDL	BDL	BDL
NOV	BDL	BDL	.	BDL	BDL	BDL

TABLE 5

DRINKING WATER SURVEILLANCE PROGRAM KITCHENER WELL SUPPLY 1990

	K21 RAW	MANNHEIM RESERVOIR	SITE 1		STRANGE ST RESERVOIR	K70 RAW
			STANDING	FREE FLOW		
O-XYLENE (UG/L)		DET'N LIMIT = 0.05		GUIDELINE = 300 (A3*)		
JAN	BDL	BDL	.	BDL	BDL	BDL
MAR	BDL	BDL	.	BDL	BDL	.
MAY	BDL	.050 <T	.	BDL	BDL	BDL
JUL	BDL	.050 <T	.	BDL	BDL	BDL
SEP	BDL	BDL	.	BDL	BDL	BDL
NOV	BDL	BDL	.	BDL	BDL	BDL
STYRENE (UG/L)		DET'N LIMIT = 0.05		GUIDELINE = 100 (D1)		
JAN	.100 <T	.100 <T	.	.100 <T	.050 <T	BDL
MAR	.250 <T	.400 <T	.	.400 <T	.350 <T	.
MAY	.150 <T	.300 <T	.	.200 <T	.200 <T	.250 <T
JUL	.100 <T	.250 <T	.	.150 <T	.150 <T	.400 <T
SEP	.500 <T	BDL	.	BDL	.050 <T	.100 <T
NOV	.150 <T	.250 <T	.	.050 <T	BDL	.150 <T
1,1 DICHLOROETHANE (UG/L)		DET'N LIMIT = 0.10		GUIDELINE = N/A		
JAN	BDL	BDL	.	BDL	BDL	BDL
MAR	BDL	BDL	.	BDL	.100 <T	.
MAY	BDL	BDL	.	BDL	.100 <T	BDL
JUL	BDL	BDL	.	.700 <T	BDL	BDL
SEP	BDL	BDL	.	1.200	BDL	BDL
NOV	BDL	BDL	.	BDL	BDL	BDL
CHLOROFORM (UG/L)		DET'N LIMIT = 0.10		GUIDELINE = 350 (A1+)		
JAN	BDL	1.000 <T	.	1.200	.400 <T	BDL
MAR	BDL	.500 <T	.	.400 <T	.500 <T	.
MAY	BDL	.200 <T	.	.300 <T	.400 <T	BDL
JUL	BDL	.600 <T	.	.300 <T	.400 <T	BDL
SEP	BDL	.300 <T	.	.300 <T	.300 <T	BDL
NOV	BDL	1.200	.	1.000 <T	.500 <T	BDL

TABLE 5

DRINKING WATER SURVEILLANCE PROGRAM KITCHENER WELL SUPPLY 1990

	K21 RAW	MANNHEIM RESERVOIR	SITE 1 STANDING	SITE 1 FREE FLOW	STRANGE ST RESERVOIR	K70 RAW
111, TRICHLOROETHANE (UG/L)		DET'N LIMIT = 0.02		GUIDELINE = 200 (D1)		
JAN	BDL	BDL	.	BDL	.720	BDL
MAR	BDL	BDL	.	BDL	.880	.
MAY	BDL	BDL	.	BDL	.820	BDL
JUL	BDL	BDL	.	.040 <T	.980	BDL
SEP	BDL	BDL	.	.040 <T	.760	BDL
NOV	BDL	BDL	.	BDL	.640	BDL
TRICHLOROETHYLENE (UG/L)		DET'N LIMIT = 0.10		GUIDELINE = 50 (A1)		
JAN	BDL	BDL	.	BDL	.300 <T	BDL
MAR	BDL	BDL	.	BDL	.400 <T	.
MAY	BDL	BDL	.	BDL	.400 <T	BDL
JUL	BDL	BDL	.	BDL	.400 <T	BDL
SEP	BDL	BDL	.	BDL	.300 <T	BDL
NOV	BDL	BDL	.	BDL	.300 <T	BDL
DICHLOROBROMOMETHANE (UG/L)		DET'N LIMIT = 0.05		GUIDELINE = 350 (A1+)		
JAN	BDL	1.100	.	1.150	.700	BDL
MAR	BDL	.950	.	.900	1.050	.
MAY	BDL	.700	.	.650	.950	BDL
JUL	BDL	1.200	.	.900	.850 <T	BDL
SEP	BDL	.600	.	.500 <T	.700	BDL
NOV	BDL	1.750	.	1.950	1.600	BDL
CHLORODIBROMOMETHANE (UG/L)		DET'N LIMIT = 0.10		GUIDELINE = 350 (A1+)		
JAN	BDL	1.400	.	1.500	1.000 <T	BDL
MAR	BDL	1.600	.	1.600	2.100	.
MAY	BDL	1.300	.	1.200	1.900	BDL
JUL	BDL	1.800	.	1.000 <T	1.300	BDL
SEP	BDL	1.300	.	.300 <T	1.100	BDL
NOV	BDL	2.400	.	2.800	3.500	BDL

TABLE 5

DRINKING WATER SURVEILLANCE PROGRAM KITCHENER WELL SUPPLY 1990

	K21 RAW	MANNHEIM RESERVOIR	SITE 1		STRANGE ST RESERVOIR	K70 RAW
			STANDING	FREE FLOW		
T-CHLOROETHYLENE (UG/L)		DET'N LIMIT = 0.05		GUIDELINE = 5 (D1)		
JAN	BDL	BDL	.	BDL	BDL	BDL
MAR	BDL	BDL	.	BDL	BDL	.
MAY	BDL	BDL	.	BDL	.050 <T	BDL
JUL	BDL	BDL	.	BDL	.050 <T	BDL
SEP	BDL	BDL	.	BDL	BDL	BDL
NOV	BDL	BDL	.	BDL	BDL	BDL
BROMOFORM (UG/L)		DET'N LIMIT = 0.20		GUIDELINE = 350 (A1+)		
JAN	BDL	.600 <T	.	.800 <T	.800 <T	BDL
MAR	BDL	1.000 <T	.	1.000 <T	2.800	.
MAY	BDL	.600 <T	.	.600 <T	2.000	BDL
JUL	BDL	.800 <T	.	.600 <T	1.000 <T	BDL
SEP	BDL	1.000 <T	.	BDL	1.200 <T	BDL
NOV	BDL	1.000 <T	.	1.200 <T	3.400	BDL
TOTAL TRIHALOMETHANES (UG/L)		DET'N LIMIT = 0.50		GUIDELINE = 350 (A1)		
JAN	BDL	4.150 <T	.	4.550 <T	2.900 <T	BDL
MAR	BDL	4.050 <T	.	3.900 <T	6.450	.
MAY	BDL	2.800 <T	.	2.850 <T	5.320	BDL
JUL	BDL	4.400 <T	.	2.750 <T	3.550 <T	BDL
SEP	BDL	3.200 <T	.	1.100 <T	3.250 <T	BDL
NOV	BDL	6.500	.	6.800	8.950	BDL

TABLE 6
DRINKING WATER SURVEILLANCE PROGRAM 1990

SCAN/PARAMETER	UNIT	DETECTION LIMIT	GUIDELINE
BACTERIOLOGICAL			
FECAL COLIFORM MEMBRANE FILTRATION	CT/100ML	0	0 (A1)
STANDARD PLATE COUNT MEMBRANE FILT.	CT/ML	0	500/ML (A3)
TOTAL COLIFORM BACKGROUND MF	CT/100ML	0	N/A
TOTAL COLIFORM MEMBRANE FILTRATION	CT/100ML	0	5/100ML (A1)
CHEMISTRY (FLD)			
FIELD COMBINED CHLORINE RESIDUAL	MG/L	0	N/A
FIELD TOTAL CHLORINE RESIDUAL	MG/L	0	N/A
FIELD FREE CHLORINE RESIDUAL	MG/L	0	N/A
FIELD PH	DMNSLESS	N/A	6.5-8.5 (A3)
FIELD TEMPERATURE	DEG.C	N/A	15.0 (A3)
FIELD TURBIDITY	FTU	N/A	1.0 (A1)
CHEMISTRY (LAB)			
ALKALINITY	MG/L	0.2	30-500 (A3)
AMMONIUM TOTAL	MG/L	0.002	0.05 (F2)
CALCIUM	MG/L	0.2	100 (F2)
CHLORIDE	MG/L	0.2	250 (A3)
COLOUR	TCU	0.5	5.0 (A3)
CONDUCTIVITY	UMHO/CM	1.0	400 (F2)
CYANIDE	MG/L	0.001	0.2 (A1)
DISSOLVED ORGANIC CARBON	MG/L	0.1	5.0 (A3)
FLUORIDE	MG/L	0.01	2.4 (A1)
HARDNESS	MG/L	0.5	80-100 (A4)
LANGELIERS INDEX	DMNSLESS	N/A	N/A
MAGNESIUM	MG/L	0.1	30.0 (F2)
NITRITE	MG/L	0.001	1.0 (A1)
NITROGEN TOTAL KJELDAHL	MG/L	0.02	N/A
PH	DMNSLESS	N/A	6.5-8.5 (A4)
PHOSPHORUS FIL REACT	MG/L	0.0005	N/A
PHOSPHORUS TOTAL	MG/L	0.002	0.4 (F2)
SODIUM	MG/L	0.2	200 (A4)
SULPHATE	MG/L	0.2	500 (A3)
TOTAL NITRATES	MG/L	0.005	10.0 (A1)
TURBIDITY	FTU	0.05	1.0 (A1)
CHLOROAROMATICS			
123 TRICHLOROBENZENE	NG/L	5.0	N/A
1234 TETRACHLOROBENZENE	NG/L	1.0	N/A
1235 TETRACHLOROBENZENE	NG/L	1.0	N/A
124 TRICHLOROBENZENE	NG/L	5.0	10000 (I)
1245-TETRACHLOROBENZENE	NG/L	1.0	38000 (D4)
135 TRICHLOROBENZENE	NG/L	5.0	N/A
236 TRICHLOROTOLUENE	NG/L	5.0	N/A
245 TRICHLOROTOLUENE	NG/L	5.0	N/A
26A TRICHLOROTOLUENE	NG/L	5.0	N/A
HEXACHLOROBENZENE	NG/L	1.0	10 (C1)
HEXACHLOROBUTADIENE	NG/L	1.0	450 (D4)
HEXACHLOROCYCLOPENTADIENE	NG/L	5.0	206000 (D4)
HEXACHLOROETHANE	NG/L	1.0	1900 (D4)
OCTACHLOROSTYRENE	NG/L	1.0	N/A
PENTACHLOROBENZENE	NG/L	1.0	74000 (D4)
CHLOROPHENOLS			
234 TRICHLOROPHENOL	NG/L	100.0	N/A
2345 TETRACHLOROPHENOL	NG/L	20.0	N/A
2356 TETRACHLOROPHENOL	NG/L	10.0	N/A

TABLE 6
DRINKING WATER SURVEILLANCE PROGRAM 1990

SCAN/PARAMETER	UNIT	DETECTION LIMIT	GUIDELINE
245 TRICHLOROPHENOL	NG/L	100.0	2600000 (D4)
246 TRICHLOROPHENOL	NG/L	20.0	5000 (A1)
PENTACHLOROPHENOL	NG/L	10.0	60000 (A1)
METALS			
ALUMINUM	UG/L	0.10	100 (A4)
ANTIMONY	UG/L	0.05	146 (D4)
ARSENIC	UG/L	0.10	25 (A1)
BARIUM	UG/L	0.05	1000 (A2)
BERYLLIUM	UG/L	0.05	6800 (D4)
BORON	UG/L	2.00	5000 (A1)
CADMIUM	UG/L	0.05	5 (A1)
CHROMIUM	UG/L	0.50	50 (A1)
COBALT	UG/L	0.02	N/A
COPPER	UG/L	0.50	1000 (A3)
IRON	UG/L	6.00	300 (A3)
LEAD	UG/L	0.05	10 (A1)
MANGANESE	UG/L	0.05	50 (A3)
MERCURY	UG/L	0.02	1 (A1)
MOLYBDENUM	UG/L	0.05	N/A
NICKEL	UG/L	0.20	350 (D3)
SELENIUM	UG/L	1.00	10 (A1)
SILVER	UG/L	0.05	50 (A1)
STRONTIUM	UG/L	0.10	N/A
THALLIUM	UG/L	0.05	13 (D4)
TITANIUM	UG/L	0.50	N/A
URANIUM	UG/L	0.05	100 (A1)
VANADIUM	UG/L	0.05	N/A
ZINC	UG/L	0.20	5000 (A3)
PAH			
ANTHRACENE	NG/L	1.0	N/A
BENZO(A) ANTHRACENE	NG/L	20.0	N/A
BENZO(A) PYRENE	NG/L	5.0	10.0 (A1)
BENZO(B) CHRYSENE	NG/L	2.0	N/A
BENZO(B) FLUORANTHENE	NG/L	10.0	N/A
BENZO(E) PYRENE	NG/L	50.0	N/A
BENZO(G,H,I) PERYLENE	NG/L	20.0	N/A
BENZO(K) FLUORANTHENE	NG/L	1.0	N/A
CHRYSENE	NG/L	50.0	N/A
CORONENE	NG/L	10.0	N/A
DIBENZO(A,H) ANTHRACENE	NG/L	10.0	N/A
DIMETHYL BENZO(A) ANTHRACENE	NG/L	5.0	N/A
FLUORANTHENE	NG/L	20.0	42000.0 (D4)
INDENO(1,2,3-C,D) PYRENE	NG/L	20.0	N/A
PERYLENE	NG/L	10.0	N/A
PHENANTHRENE	NG/L	10.0	N/A
PYRENE	NG/L	20.0	N/A
PESTICIDES & PCB			
ALACHLOR (LASSO)	NG/L	500.0	5000 (A2)
ALDRIN	NG/L	1.0	700 (A1)
ALPHA HEXACHLOROCYCLOHEXANE (BHC)	NG/L	1.0	700 (G)
ALPHA CHLORDANE	NG/L	2.0	7000 (A1)
AMETRINE	NG/L	50.0	300000 (D3)
ATRATONE	NG/L	50.0	N/A
ATRAZINE	NG/L	50.0	60000 (A2)
DES ETHYL ATRAZINE	NG/L	200.0	60000 (A2)
BETA HEXACHLOROCYCLOHEXANE (BHC)	NG/L	1.0	300 (G)
CYANAZINE (BLADEX)	NG/L	100.0	10000 (A2)
O,P-DDD	NG/L	5.0	10 (I)
DIELDRIN	NG/L	2.0	700 (A1)
ENDOSULFAN 1 (THIODAN I)	NG/L	2.0	74000 (D4)
ENDOSULFAN 2 (THIODAN II)	NG/L	5.0	74000 (D4)

TABLE 6
DRINKING WATER SURVEILLANCE PROGRAM 1990

SCAN/PARAMETER	UNIT	DETECTION LIMIT	GUIDELINE
ENDOSULFAN SULPHATE (THIODAN SULPHATE)	NG/L	5.0	N/A
ENDRIN	NG/L	5.0	1600 (D3)
GAMMA CHLORDANE	NG/L	2.0	7000 (A1)
HEPTACHLOR	NG/L	1.0	3000 (A1)
HEPTACHLOR EPOXIDE	NG/L	1.0	3000 (A1)
LINDANE (GAMMA BHC)	NG/L	1.0	4000 (A1)
METHOXYCHLOR	NG/L	5.0	900000 (A1)
METOLACHLOR	NG/L	500.0	50000 (A2)
METRIBUZIN (SENCOR)	NG/L	100.0	80000 (A1)
MIREX	NG/L	5.0	N/A
P,P-DDD	NG/L	5.0	N/A
O,P-DDT	NG/L	5.0	30000 (A1)
OXYCHLORDANE	NG/L	2.0	N/A
PCB	NG/L	20.0	3000 (A2)
PPDDE	NG/L	1.0	30000 (A1)
PPDDT	NG/L	5.0	30D00 (A1)
PROMETONE	NG/L	50.0	52500 (D3)
PROMETRYNE	NG/L	50.0	1000 (A2)
PROPAZINE	NG/L	50.0	700000 (D3)
SIMAZINE	NG/L	50.0	10000 (A2)
D-ETHYL SIMAZINE	NG/L	200.0	10000 (A2)
TOXAPHENE	NG/L	500.0	5000 (A1)
PHENOLICS			
PHENOLICS (UNFILTERED REACTIVE)	UG/L	0.2	2 (A4)
SPECIFIC PESTICIDES			
2,4 D PROPIONIC ACID	NG/L	100.	N/A
2,4,5-TRICHLOROPHENOXY ACETIC ACID	NG/L	50.	280000 (A1)
2,4-DICHLOROBUTYRIC ACID (2,4-D)	NG/L	100.	100000 (A1)
24-DICHLORORPHENOXYBUTYRIC ACID (24-DB)	NG/L	200.	18000 (B3)
BUTYLATE (SUTAN)	NG/L	2000.	245000 (D3)
CARBARYL (SEVIN)	NG/L	200.	90000 (A1)
CARBOFURAN	NG/L	2000.	90000 (A1)
CHLORPYRIFOS (DURSBAN)	NG/L	20.	N/A
CICP (CHLORPROPHAM)	NG/L	2000.	350000 (G)
DIALLATE	NG/L	2000.	N/A
DIAZINON	NG/L	20.	20000 (A1)
DICAMBA	NG/L	50.	120000 (A1)
DICHLOROVOS	NG/L	20.	N/A
EPTAM	NG/L	2000.	N/A
ETHION	NG/L	20.	35000 (G)
IPC	NG/L	2000.	N/A
MALATHION	NG/L	20.	190000 (A1)
METHYL PARATHION	NG/L	50.	7000 (B3)
METHYLTRITHION	NG/L	20.	N/A
MEVINPHOS	NG/L	20.	N/A
PARATHION	NG/L	20.	50000 (A1)
PHORATE (THIMET)	NG/L	20.	2000 (A2)
PROPOXUR (BAYGON)	NG/L	2000.	140000 (D3)
RELDAN	NG/L	20.	N/A
RONNEL	NG/L	20.	N/A
SILVEX (2,4,5-TP)	NG/L	20.	10000 (A1)
VOLATILES			
1,1 DICHLOROETHANE	UG/L	0.10	N/A
1,1 DICHLOROETHYLENE	UG/L	0.10	7 (D1)
1,2 DICHLOROBENZENE	UG/L	0.05	200 (A1)
1,2 DICHLORDETHANE	UG/L	0.05	5 (A1)

TABLE 6
DRINKING WATER SURVEILLANCE PROGRAM 1990

SCAN/PARAMETER	UNIT	DETECTION LIMIT	GUIDELINE
1,2 DICHLOROPROPANE	UG/L	0.05	5 (D1)
1,3 DICHLOROBENZENE	UG/L	0.10	3750 (D3)
1,4 DICHLOROBENZENE	UG/L	0.10	5 (A1)
111, TRICHLOROETHANE	UG/L	0.02	200 (D1)
112 TRICHLOROETHANE	UG/L	0.05	0.6 (D4)
1122 TETRACHLOROETHANE	UG/L	0.05	0.17(D4)
BENZENE	UG/L	0.05	5 (A1)
BROMOFORM	UG/L	0.20	350 (A1+)
CARBON TETRACHLORIDE	UG/L	0.20	5 (A1)
CHLOROBENZENE	UG/L	0.10	1510 (D3)
CHLORODIBROMOMETHANE	UG/L	0.10	350 (A1+)
CHLOROFORM	UG/L	0.10	350 (A1+)
DICHLOROBROMOMETHANE	UG/L	0.05	350 (A1+)
ETHLYENE DIBROMIDE	UG/L	0.05	50 (D1)
ETHYLBENZENE	UG/L	0.05	2.4 (A3)
M-XYLENE	UG/L	0.10	300 (A3*)
METHYLENE CHLORIDE	UG/L	0.50	50 (A1)
O-XYLENE	UG/L	0.05	300 (A3*)
P-XYLENE	UG/L	0.10	300 (A3*)
STYRENE	UG/L	0.05	100 (D1)
TETRACHLOROETHYLENE	UG/L	0.05	5 (D1)
TRANS 1,2 DICHLOROETHYLENE	UG/L	0.10	70 (D1)
TOLUENE	UG/L	0.05	24 (A3)
TOTAL TRIHALOMETHANES	UG/L	0.50	350 (A1)
TRICHLOROETHYLENE	UG/L	0.10	50 (A1)

Appendix A

DRINKING WATER SURVEILLANCE PROGRAM
PROGRAM DESCRIPTION

The Drinking Water Surveillance Program (DWSP) for Ontario monitors drinking water quality at municipal water supply systems. The DWSP Database Management System provides a computerized drinking water quality information system for the supplies monitored. The objectives of the program are to provide:

- immediate, reliable, current information on drinking water quality;
- a flagging mechanism for guideline exceedance;
- a definition of contaminant levels and trends;
- a comprehensive background for remedial action;
- a framework for assessment of new contaminants; and
- an indication of treatment efficiency of plant processes.

PROGRAM

The DWSP officially began in April 1986 and is designed to eventually include all municipal water supplies in Ontario. In 1990, 76 systems were being monitored. Water supply locations have been prioritized for surveillance based primarily on criteria such as population density, probability of contamination and geographical location.

An ongoing assessment of future monitoring requirements at each location will be made. Monitoring will continue at the initial locations at an appropriate level and further locations will be phased into the program as resources permit.

A major goal of the program is to collect valid water quality data in context with plant operational characteristics at the time of sampling. As soon as sufficient data have been accumulated and analyzed, both the frequency of sampling and the range of parameters may be adjusted accordingly.

Assessments are carried out at all locations prior to initial sampling, in order to acquire complete plant process and distribution system details and to designate (and retrofit if necessary) all sampling systems and locations. This ensures that the sampled water is a reflection of the water itself.

Samples are taken of raw (ambient water) and treated water at the treatment plant and of consumer's tap water in the distribution system. In order to determine possible effects of distribution on water quality, both standing and free flow water in old and new sections of the distribution system are sampled. Sampling is carried out by operational personnel who have been trained in applicable procedures.

Comprehensive standardized procedures and field test kits are supplied to sampling personnel. This ensures that samples are taken and handled according to standard protocols and that field testing will supply reliable data. All field and laboratory analyses are carried out using "approved documented procedures". Most laboratory analyses are carried out by the Ministry of Environment (MOE), Laboratory Services Branch. Radionuclides are analyzed by the Ministry of Labour.

DATA REPORTING MECHANISM

When the analytical results are transferred from the MOE laboratory into the DWSP system, printouts of the completed analyses are sent to the MOE District Officer, the appropriate operational staff and are also retained by the DWSP unit.

PROGRAM INPUTS AND OUTPUTS

There are four major inputs and four major outputs in the program.

Program Input - Plant and Distribution System Description

The system description includes plant specific non-analytical information acquired through a questionnaire and an initial plant visit. During the initial assessment of the plant and distribution system, questionnaire content is verified and missing information added. It is intended that all data be kept current with scheduled annual updates.

The Plant and Distribution System Description consists of the following seven components:

1. PROCESS COMPONENT INVENTORY
All physical and chemical processes to which the water is subjected, from the intake pipe to the consumers' tap (where possible), are documented. These include: process type, general description of physical structures, material types, sizes, and retention time for each process within the plant. The processes may be as simple as transmission or as complex as carbon adsorption.

2. TREATMENT CHEMICALS
Chemicals used in the treatment processes, their function, application point, supplier and brand-name are recorded. Chemical dosages applied on the day of sampling are recorded in DWSP.

3. PROCESS CONTROL MEASUREMENTS
Documentation of in-plant monitoring of process parameters (eg. turbidity, chlorine residuals, pH, aluminum residuals) including methods used, monitoring locations and frequency is contained in this section. Except for the recorded Field Data, in-plant monitoring results are not retained in DWSP but are retained by the water treatment plant personnel.

4. DESIGN FLOW AND RETENTION TIME
Hydraulic capacity, designed and actual, is noted here. Retention time (the time that a block of water is retained in the plant) is also noted. Maximum, minimum and average flow, as well as a record of the flow rate on the day of sampling, are recorded in DWSP.

5. DISTRIBUTION SYSTEM DESCRIPTION
This area includes the storage and transmission characteristics of the distribution system after the water leaves the plant.

6. SAMPLING SYSTEM
Each plant is assessed for its adequacy in terms of the sampling of bacteriological, organic and inorganic parameters. Prime considerations in the assessment and design of the sampling system are:

i/ the sample is an accurate representation of the actual water condition, eg. raw water has had no chemical treatment;

ii/ the water being sampled is not being modified by the sampling system;

iii/ the sample tap must be in a clean area of the plant, preferably a lab area; and

iv/ the sample lines must be organically inert (no plastic, ideally stainless steel).

It is imperative that the sampled water be a reflection not of the sampling system but of the water itself.

The sampling system documentation includes: origin of the water; date sampling was initiated; size, length and material type (intake,

discharge and tap); pump characteristics (model, type, capacity); and flow rate.

7. PERSONNEL
This section contains the names, addresses and phone numbers of current plant management and operational staff, distribution system management and operational staff, Medical Officer of Health and appropriate MOE personnel associated with the plant.

Program Input - Field Data

The second major input to DWSP is field data. Field data is collected at the plant and from the distribution system sites on the day of sampling. Field data consists of general operating conditions and the results of testing for field parameters. General operating conditions include chemicals used, dosages, flow and retention time on the day of sampling, as well as, monthly maximum, minimum and average flows. Field parameters include turbidity, chlorine residuals (free, combined and total), temperature and pH. These parameters are analyzed according to standardized DWSP protocols to allow for interplant comparison.

Program Input - Laboratory Analytical Data

The third major input to DWSP is Laboratory Analytical Data. Samples gathered from the raw, treated and distribution sampling sites are analyzed for the presence of approximately 180 parameters at a frequency of two to twelve times per year. Sixty-five percent of the parameters are organic. Parameters measured may have health or aesthetic implications when present in drinking water. Many of the parameters may be used in the treatment process or may be treatment by-products. Due to the nature of certain analytical instruments, parameters may be measured in a "scan" producing some results for parameters that are not on the DWSP priority list, but which may be of interest. The majority of parameters are measured on a routine basis. Those that are technically more difficult and/or costly to analyze, however, are done less frequently. These include Specific Pesticides and Chlorophenols.

Although the parameter list is extensive, additional parameters with the potential to cause health or aesthetic related problems may be added provided reliable analytical and sampling methods exist.

All laboratory generated data is derived from standardized, documented analytical protocols. The analytical method is an integral part of the data and as methods change, notation will be made and comparison data documented.

Program Input - Parameter Reference Information

The fourth major input to DWSP is Parameter Reference Information. This is a catalogue of information for each substance analyzed on DWSP. It includes parameter name and aliases, physical and chemical properties, basic toxicology, world-wide health limits, treatment methods and uses. The Parameter Reference Information is computerized and can be accessed through the Query function of the DWSP database. An example is shown in figure 1.

Program output - Query

All DWSP information is easily accessed through the Query function, therefore, anything from addresses of plant personnel to complete water quality information for a plant's water supply is instantly available. The DWSP computer system makes relatively complex inquiries manageable. A personal password allowing access into the DWSP query mode in all MOE offices is being developed by the DWSP group.

Program Output - Action Alerts

Drinking Water quality in Ontario is evaluated against provincial objectives as outlined in the Ontario Drinking Water Objectives publication. Should the reported level of a substance in treated water exceed the Ontario Drinking Water Objective, an "Action Alert" requiring resampling and confirmation is issued. This assures that operational staff, health authorities and the public are notified as soon as possible of the confirmation of an exceedance and remedial action taken. This report supplies a history of the occurrence of past exceedances at the plant plus a historical summary on the parameter of concern.

In the absence of Ontario Drinking Water Objectives, guidelines/limits from other agencies are used. The Parameter Listing System, published by MOE (ISBN 0-7729-4461-X), catalogues and keeps current guidelines for 650 parameters from agencies throughout the world. If these guidelines are exceeded, the results are flagged and evaluated by DWSP personnel. An "Action Alert" will be issued if warranted.

Program Output - Report Generation

Custom reports can be generated from DWSP to meet MOE Regional needs and to respond to public requests.

Program Output - Annual Reports

It is the practice of DWSP to produce an annual report containing analytical data along with companion plant information.

FIG.1

MOE - DRINKING WATER ASSESSMENT PROGRAM (DWSP)

PARAMETER REFERENCE INFORMATION

BENZENE (B2001P) VOLATILES

CLASS: HEALTH METHOD: P0C0D0 UNIT: µg/L

SOURCE	FROM	TO	METHOD	GUIDELINE	UNIT	NOTE
CAL C	85/01			0.700	µg/L	AL
CDWG C	87/01			5.000	µg/L	MAC
EPA C	87/07			5.000	µg/L	MCL
EPAA C	80/11			6.600	µg/L	AMBIENT **
FERC C	84/05			1.000	µg/L	MCL
WHO C	84/01			10.000	µg/L	GV

DESCRIPTION:**NAME:** BENZENE
CAS#: 71-43-2
MOLECULAR FORMULAE: C_6H_6
DETECTION LIMIT: (FOR METHOD POCODO) 0.05 µg/L
SYNONYMS: BENZOL; BENZOLE; COAL NAPHTHA; CARBON OIL (27). CYCLOHEXATRIENE (41).
CHARACTERISTICS: COLOURLESS TO LIGHT-YELLOW, MOBILE, NON-POLAR LIQUID, OF HIGHLY REFRACTIVE NATURE, AROMATIC ODOUR; VAPOURS BURN WITH SMOKING FLAME (30).
PROPERTIES: SOLUBILITY IN WATER: 1780-1800 mg/L AT 25C (41). THRESHOLD ODOUR: 0.5 - 10 PPM IN WATERTHRESHOLD TASTE: 0.5 mg/L IN WATER (39).
ENVIRONMENTAL FATE: MAY BIOACCUMULATE IN LIVING ORGANISMS AND APPEARS TO ACCUMULATE IN ANIMAL TISSUES THAT EXHIBIT A HIGH LIPID CONTENT OR REPRESENT MAJOR METABOLIC SITES, SUCH AS LIVER OR BRAIN; SMALL QUANTITIES EVAPORATE FROM SOILS OR ARE DEGRADED RATHER QUICKLY (80).
SOURCES: COMMERCIAL: PETROLEUM REFINING; SOLVENT RECOVERY; COAL TAR DISTILLATION (39); FOOD PROCESSING AND TANNING INDUSTRIES; COMBUSTION OF CAR EXHAUST.
ENVIRONMENTAL: POSSIBLE SOURCE IS RUNOFF.

USES: DETERGENTS; NYLON; INTERMEDIATE IN PRODUCTION OF OTHER COMPOUNDS, SUCH AS PESTICIDES; SOLVENT FOR EXTRACTION AND RECTIFICATION IN RUBBER INDUSTRY; DEGREASING AND CLEANSING AGENT; GASOLINE.

TOXICITY: RATING: 4 (VERY TOXIC).
ACUTE: IRRITATING TO MUCOUS MEMBRANES; SYMPTOMS INCLUDE RESTLESSNESS, CONVULSIONS, EXCITEMENT, DEPRESSION; DEATH MAY FOLLOW RESPIRATORY FAILURE.
CHRONIC: MAY CAUSE ANAEMIA AND LEUKAEMIA (45); MUTAGENIC.
MODE OF ACTION: CHROMOABERRATION IN LYMPHOCYTE CULTURES.

CARCINOGENICITY: A KNOWN HUMAN CARCINOGEN.

REMOVAL: THE FOLLOWING PROCESSES HAVE BEEN SUCCESSFUL IN REMOVING BENZENE FROM WASTEWATER: GAC ADSORPTION, PRECIPITATION WITH ALUM AND SUBSEQUENT REMOVAL VIA SEDIMENTATION, COAGULATION AND FLOCCULATION, SOLVENT EXTRACTION, OXIDATION

ADDITIONAL PROPERTIES:
MOLECULAR WEIGHT: 78.12
MELTING POINT: 5.5°C (27).
BOILING POINT: 80.1°C (27).
SPECIFIC GRAVITY: 0.8790 AT 20°C (27).
VAPOUR PRESSURE: 100 MM AT 26.1°C (27).
HENRY'S LAW CONSTANT: 0.00555 ATM-M3/MOLE (41).
LOG OCT./WATER PARTITION COEFFICIENT: 1.95 TO 2.13 (39).
CARBON ADSORPTION: K=1.0; 1/N=1.6; R=0.97; PH=5.3 (41)SEDIMENT/WATER PARTITION COEFFICIENT: NO DATA

NOTES: EPA PRIORITY POLLUTANT.

Appendix B

DWSP SAMPLING GUIDELINE

i) Raw and Treated at Plant

General Chemistry	-500 mL plastic bottle (PET 500) -rinse bottle and cap with sample water three times -fill to 2 cm from top
Bacteriological	-220 mL plastic bottle with white seal on cap -do not rinse bottle, preservative has been added -avoid touching bottle neck or inside of cap -fill to top of red label as marked
Metals	-500 mL plastic bottle (PET 500) -rinse bottle and cap three times -fill to 2 cm from top -add 10 drops nitric acid (HNO_3) (**Caution:** HNO_3 is corrosive)
Volatiles (duplicates) (OPOPUP)	-45 mL glass vial with septum (teflon side must be in contact with sample) -do not rinse bottle -fill bottle completely without bubbles
Organics (OWOC),(OWTRI),(OAPAHX)	-1 L amber glass bottle per scan -do not rinse bottle -fill to 2 cm from top -when 'special pesticides' are requested three extra bottles must be filled

Cyanide	-500 mL plastic bottle (PET 500) -rinse bottle and cap three times -fill to 2 cm from top -add 10 drops sodium hydroxide (NaOH) (**Caution:** NaOH is corrosive)
Mercury	-250 mL glass bottle -rinse bottle and cap three times -fill to top of label -add 20 drops each nitric acid (HNO_3) and potassium dichromate ($K_2Cr_2O_7$) (**Caution:** HNO_3&$K_2Cr_2O_7$ are corrosive)
Phenols	-250 mL glass bottle -do <u>not</u> rinse bottle, preservative has been added -fill to top of label
Radionuclides (as scheduled)	-4 L plastic jug -do <u>not</u> rinse, carrier added -fill to 5 cm from top
Organic Characterization (GC/MS - once per year)	-1 L amber glass bottle; instructions as per organic -250 mL glass bottle -do <u>not</u> rinse bottle -fill completely without bubbles

<u>Steps:</u>

1. Let sampling water tap run for an adequate time to clear the sample line.

2. Record time of day on submission sheet.

3. Record temperature on submission sheet.

4. Fill up all bottles as per instructions.

5. Record chlorine residuals (free, combined and total for treated water only), turbidity and pH on submission sheet.

ii) Distribution Samples (standing water)

General Chemistry	-500 mL plastic bottle (PET 500) -rinse bottle and cap with sample water three times -fill to 2 cm from top
Metals	-500 mL plastic bottle (PET 500) -rinse bottle and cap three times -fill to 2 cm from top -add 10 drops nitric acid (HNO_3) (**Caution:** HNO_3 is corrosive)

Steps:

1. Record time of day on submission sheet.
2. Place bucket under tap and open cold water.
3. Fill to predetermined volume.
4. After mixing the water, record the temperature on the submission sheet.
5. Fill general chemistry and metals bottles.
6. Record chlorine residuals (free, combined and total), turbidity and pH on submission sheet.

iii) Distribution Samples (free flow)

General Chemistry	-500 mL plastic bottle (PET 500) -rinse bottle and cap with sample water three times -fill to 2 cm from top
Bacteriological	-250 mL plastic bottle with white seal on cap -do <u>not</u> rinse bottle, preservative has been added -avoid touching bottle neck or inside of cap -fill to top of red label as marked

Metals	-500 mL plastic bottle (PET 500) -rinse bottle and cap three times -fill to 2 cm from top -add 10 drops nitric acid HNO_3 (**Caution:** HNO_3 is corrosive)
Volatiles (duplicate) (OPOPUP)	-45 mL glass vial with septum (teflon side must be in contact with sample) -do not rinse bottle, preservative has been added -fill bottle completely without bubbles
Organics (OWOC) (OAPAHX)	-1 L amber glass bottle per scan -do not rinse bottle -fill to 2 cm from top

Steps:

1. Record time of day on submission sheet.

2. Let cold water flow for five minutes.

3. Record temperature on submission sheet.

4. Fill all bottles as per instructions.

5. Record chlorine residuals (free, combined and total), turbidity and pH on submission sheet.